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The Werner Arithmetic

Frank H. Hall

Book I

Educ T 118.96.450

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THE WERNER

ARITHMETIC

ORAL AND WRITTEN

[R K 1]

FOR THIRD AND FOURTH GRADES

BY

FRANK H. HALL

CHICAGO NEW YORK

WERNER SCHOOL BOOK COMPANY

EducT 118.96.450

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PREFACE.

The Werner Arithmetics present the following characteristic features:

1. Strict Classification is Made Subordinate to Gradation.

Proper sequence with reference to the pupil has been constantly in the thought of the author in his selection and arrangement of matter. In the first two books of the series (grades 3 to 6 inclusive) the attempt has been made to give the student a body of knowledge which later he may classify as a working basis for his advancement into the higher mathematics. In the third book, more attention is given to classification, and the elements of algebra and geometry are presented.

2. They are Emphatically "Mental Arithmetics."

They are also "Complete Arithmetics" in the sense that they provide or suggest the work neccessary for a complete primary, intermediate and grammar school course in arithmetic.

Very many problems similar to those usually found in the so-called Mental Arithmetics appear, but in such close relation to problems in which larger numbers are employed, that the pupil passes from one to the other without obtaining the false notion that there are two kinds of arithmetic, namely, "mental" and "written." See first book, pages 132, 142, 167, 172, 179, 189, etc.

3. The Pupil is Introduced in the Beginning to the Five Fundamental Processes.

The first five lines of this book (page 9) present problems in addition, subtraction, multiplication, division noting the number of groups, and division noting the number in each group. Then, by a kind of spiral advancement, the pupil moves around this circle and upward through all the intricacies of combination, separation and comparison of numbers.

4. In the Lower Grades the Pupil is Made Familiar with New Terms by Means of Oral Instruction and Frequent Use of the Terms Employed.

(*See first book, pages 53, 63, 73, 188, 218, etc.*)

Many years ago Col. Francis W. Parker said, substantially, that the arithmetic of the future would contain neither rules, definitions nor explanations. These books are, in part, a fulfillment of that prophecy. In the first two books of the series definitions are introduced after the pupils are familiar with the terms defined. Formal rules are omitted entirely, and the uniform direction to the teacher is, "If the child cannot solve the problem presented, do not explain, but give him problems that he can solve and so lead up to and over the difficulty."

5. The Arrangement of Topics is Unique and Convenient.

In this book, measurement problems appear on pages 43, 53, 63, 73, etc.; a certain class of fraction problems, on pages 45, 55, 65, 75, etc.; facts of addition, subtraction, multiplication and division, on pages 41, 51, 61, 71, etc. This decimal arrangement of subjects makes the books almost as convenient for reference as are the books that are made on the strict classification plan, while the frequent recurrence of similar matter insures thorough review.

F. H. H.

WAUKEGAN, ILL., March, 1896.

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THIRD GRADE. PART II.

Numbers to 1,000.

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FOURTH GRADE.

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Denominate numbers; cubic inches, cubic feet, ounces, pounds, United States money. Common fractions; all operations, with no denominator greater than 100. Decimal fractions; tenths, hundredths. Elementary work in ratio and proportion. Measurements; lines and surfaces 154–256

See pages 40 and 154.

To the Teacher.—Pages 6 and 7 of this book are not for the pupil's use. They contain the number facts and terms that should be taught orally to Second Grade Pupils.

Thirty-Three Facts of Addition.

1	2	3	2	4	3	5	4	3	6	5	4	7	6	5	4
1	1	1	2	1	2	1	2	3	1	2	3	1	2	3	4
2	3	4	4	5	5	6	6	6	7	7	7	8	8	8	8
8	7	6	5	9	8	7	6	5	9	8	7	6	9	8	7	6
1	2	3	4	1	2	3	4	5	2	3	4	5	3	4	5	6
9	9	9	9	10	10	10	10	10	11	11	11	11	12	12	12	12

If the thirty-three facts of addition given above are taught properly, the pupil will, at the same time, acquire a knowledge of the corresponding facts of subtraction; thus, if it is clear to the pupil that 7 and 5 are 12, he will also know that 12 less 7 are 5, and that 12 less 5 are 7.

Twelve Facts of Multiplication.

2 twos = 4.	3 twos = 6.	4 twos = 8.	5 twos = 10.
6 twos = 12.	2 threes = 6.	3 threes = 9.	4 threes=12.
2 fours = 8.	3 fours = 12.	2 fives = 10.	2 sixes = 12.

If these twelve facts of multiplication are taught properly, the pupil will, at the same time, acquire a knowledge of twelve facts of division; thus, if it is clear to him that 3 twos are 6, it must be equally clear that 6 is 3 twos; or, to use the ordinary mathematical expression of this fact, that 2 is contained in 6 three times.

These twelve facts of multiplication will also give to the thoughtful pupil twelve other facts of division, often called

Twelve Facts of Partition.

$\frac{1}{2}$ of 4 = 2.	$\frac{1}{3}$ of 6 = 2.	$\frac{1}{4}$ of 8 = 2.	$\frac{1}{5}$ of 10 = 2.
$\frac{1}{6}$ of 12 = 2.	$\frac{1}{2}$ of 6 = 3.	$\frac{1}{3}$ of 9 = 3.	$\frac{1}{4}$ of 12 = 3.
$\frac{1}{2}$ of 8 = 4.	$\frac{1}{3}$ of 12 = 4.	$\frac{1}{2}$ of 10 = 5.	$\frac{1}{2}$ of 12 = 6.

Seven Denominate Number Facts.

1 foot = 12 inches. 3 feet = 1 yard. 2 nickels = 1 dime.
10 dimes = 1 dollar. 2 pints = 1 quart. 4 quarts = 1 gallon.
100 cents = 1 dollar.

Test and cultivate the conceptive power of the pupil by questions in pairs like the following:

1 { Four pints are how many quarts?
  { Four quarts are how many pints?

2 { Three feet are how many yards?
  { Three yards are how many feet?

Facts of Partition and Multiplication.

4 is $\frac{2}{3}$ of 6.	6 is $\frac{2}{3}$ of 9.	8 is $\frac{2}{3}$ of 12.
6 is $\frac{3}{4}$ of 8.	9 is $\frac{3}{4}$ of 12.	4 is $\frac{2}{5}$ of 10.

It will be observed that these facts are combinations of facts given before. The work should be performed first with objects.

It is very desirable that the pupil shall give the answer to such questions as 6 is $\frac{2}{3}$ of how many, not from memory, but by thinking 6 objects divided into 2 groups and by adding to the 2 groups another similar group. (111 111) 111. To aid in securing correct mental processes it will be found profitable to give questions in pairs like the following:

1 { Two thirds of six are how many?
  { Six is two thirds of how many?

2 { One half of four is how many?
  { Four is one half of how many?

If this work is done properly, the pupil will be able to answer questions outside the "beaten track;" thus, he will readily answer the following: *Ten is two thirds of how many? Two thirds of eighteen are how many?* The real measure of the value of arithmetical training is the ability of the pupil in solving problems that are in some respect unlike those he has had before.

Other Facts of Partition.

$\frac{1}{2}$ of 3 = $1\frac{1}{2}$. $\frac{1}{2}$ of 5 = $2\frac{1}{2}$. $\frac{1}{2}$ of 7 = $3\frac{1}{2}$.

$\frac{1}{2}$ of 9 = $4\frac{1}{2}$. $\frac{1}{2}$ of 11 = $5\frac{1}{2}$. $\frac{1}{3}$ of 7 = $2\frac{1}{3}$.

One half of three is how many?

Three is one half of how many?

All the facts of combination and separation should be first worked out with objects and may be applied to measurements. The pupil should be able to fill the blanks in such statements as the following:

1 { Two thirds of 9 inches are ——— inches.
  { Eight inches are two thirds of ——— inches.

2 { Three fourths of 8 inches are ——— inches.
  { Nine inches are three fourths of ——— inches.

Not by definition but by frequent use, the pupil should become familiar with the following terms and expressions: *add, subtract, multiply, divide, sum, difference, product, quotient, square, oblong, triangle, square inch, 2-inch square, 3-inch square, is contained in.*

Do not use the sign (×) for the word times. Whenever this sign is employed in the lower grades it should be used for the words *multiplied by.*

Teach the pupil to count objects to 100, and to count (add) *by twos* and *by tens.*

SUGGESTIONS TO TEACHERS.

1. Do not permit the pupil to attempt the work of any page of this book until he has been properly prepared for it.

This preparation will consist of either (a) an oral presentation of work similar to that found on the page or (b) a review of work already done. The amount of oral work may be, often should be, many times as much as is given in the book. Be sure that the oral work *precedes* the book work. As often as the pupil is confronted with a seemingly insurmountable difficulty, have recourse, either to review, or to an oral presentation of the subject. *If the child cannot solve the problem presented, do not explain; but give him problems that he can solve and so lead up to and over the difficulty.*

2. Often ask—"What is the meaning?"

If the pupil knows the meaning of the following expressions, he finds little difficulty in answering the questions correctly:

$\frac{1}{4} + \frac{1}{4} = ?$ (Find how many times $\frac{1}{4}$ is contained in $\frac{1}{4}$).
$\frac{1}{4} + 3 = ?$ (Find one third of $\frac{1}{4}$).
$\frac{1}{4} \times 2\frac{1}{3} = ?$ (Two times $\frac{1}{4}$, plus one third of $\frac{1}{4}$).

Three fourths of the difficulty usually found in common and decimal fractions vanishes, if the teacher selects problems wisely (that is, considers them in their proper order) and habitually requires the pupil to tell the meaning of the expression *before* he attempts the solution of the problem. Too often the pupil is required to "juggle with the figures" and then *explain the juggling.*

3. The order of procedure in the lower grades should usually be as follows:

(a) Work with objects.
(b) Work without objects, but with concrete problems.
(c) Work with abstract problems.
(d) Require the pupil to convert the abstract problems into concrete problems.

4. Do not waste time in "pretty," useless, namby-pamby number stories in connection with splints or toothpicks.

The *time* for the number story is immediately after the solution of an abstract problem; the *purpose*, to lead the pupil to keep in view the possible application of his abstract work. Require the number story (the concrete problem) as often as there seems to be danger that the pupil does not see the application of an abstract problem. *This danger arises mainly in connection with multiplication and the two cases of division, especially in common and in decimal fractions.*

THE WERNER ARITHMETIC.

THIRD GRADE. PART I.*

1. Four and two are ——.	3 and 2 are ——.
2. Five less two are ——.	6 less 3 are ——.
3. Three times two are ——.	2 twos are ——.
4. Six is —— twos.	4 is —— twos.
5. One half of two is ——.	2 is one half of ——.
6. Five and three are ——.	4 and 3 are ——.
7. Seven less four are ——.	8 less 5 are ——.
8. Four times two are ——.	3 twos are ——.
9. Eight is —— twos.	8 is —— fours.
10. One half of four is ——.	4 is one half of ——.

11. William earned 5 cents and his brother earned 6 cents; together they earned —— cents.

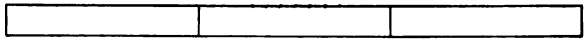
12. James had 12 cents; he gave his sister 4 cents; he then had —— cents.

13. John paid 2 cents each for 5 pencils; for all he paid —— cents.

14. Harry has 10 cents; oranges cost 5 cents each; he can buy —— oranges.

15. Richard paid 8 cents for 2 lemons; one lemon cost —— cents.

*Pages 9 to 22 inclusive, are at once a review and a test. If the pupil is prepared to read in a "third reader," and if the second grade number work outlined on pages 6 and 7 of this book, has been mastered, he will read these lessons without much hesitation. If he finds difficulty in calling the words, lay the book aside and teach him to read. If he cannot readily fill the blanks, teach him *orally* the second grade number work outlined on the preceding pages.



One fourth of a foot.

1. Twelve inches are —— foot.
2. Six inches are —— —— of a foot.
3. One third of a foot is —— inches.
4. Three inches are —— —— of a foot.
5. Two thirds of a foot are —— inches.
6. Nine inches are —— —— of a foot.
7. One half of a foot and 2 inches are —— inches.
8. One half of a foot less 2 inches are —— inches.
9. Three times 2 inches are —— inches.
10. Two inches are contained in 8 inches —— times.
11. One half of 7 inches is ——— inches.

12. Mary's pencil is 3 inches long; Alice's pencil is 4 inches long; together they are —— inches long.

13. Jane had a pencil 8 inches long; she broke off a piece 2 inches long; what remained was —— inches long.

14. Think of a square. A square has —— sides. One side of a 2-inch square measures —— inches. All the sides of a 2-inch square together measure —— inches.

15. Ann had a piece of ribbon 10 inches long; she cut it into 2-inch pieces; there were —— pieces.

16. I am thinking of a square. It has —— equal sides. All its sides together measure 12 inches. It is a —— inch square.

17. Three times 2 are — —. Three times 3 are ——.
18. Three times 4 are ——. Four times 2 are ——.
19. Four times 3 are ——. Six times 2 are ——.
20. Two times 6 are ——. Two times 5 are ——.
21. Two times 4 are ——. Two times 3 are ——.
22. Two times 2 are ——. Five times 2 are ——.

1. Ten and two are ——.	10 and 3 are ——.
2. Ten less two are ——.	10 less 4 are ——.
3. Three times ten are ——.	5 times 10 are ——.
4. Forty is —— tens.	60 is —— tens.
5. One half of 40 is ——.	10 is one half of ——.
6. Twenty and 10 are ——.	20 and 20 are ——.
7. Twenty less 2 are ——.	30 less 2 are ——.
8. Four times 10 are ——.	6 times 10 are ——.
9. Seventy is —— tens.	50 is —— tens.
10. One third of 30 is ——.	$\frac{2}{3}$ of 30 are ——.

11. A boy paid 2 dimes for a slate and 3 dimes for a book; for both he paid —— cents.

12. The price of Susie's book was 38 cents; she gave the salesman 4 dimes; she should receive in change —— cents.

13. At 10 cents a yard, 2 yards of ribbon cost —— cents; one half of a yard costs —— cents; two and one half yards cost —— cents.

14. For some railroad tickets I paid 60 cents; each ticket cost 10 cents; there were —— tickets.

15. For 4 melons James paid 40 cents; one melon cost —— cents. One fourth of 40 cents is —— cents.

(1) Read problems and give sums at sight. (2) Copy and add. (3) Tell number stories *

20	21	23	22	22	28
4	4	4	6	2	2

* Do not omit this part of the work. The number story suggested by the first problem might be: — I had 20 cents; I earned 4 cents; I then had 24 cents; or, 20 apples were on the ground under an apple tree; 4 more fell off; then there were 24 on the ground. Variety will add to the interest.

1. One foot is —— inches.
2. Two feet are 24 inches.
3. Three feet are 36 inches.
4. One yard is —— feet.
5. One yard is —— inches.
6. One half of a yard is ——.
7. One third of a yard is ——.
8. Two thirds of a yard are ——.
9. Six inches and 6 inches are —— inches.
10. One foot less 6 inches are —— inches.
11. Four times 3 inches are —— inches.
12. Three inches are contained in 12 inches —— times.
13. One third of 12 inches is —— inches.
14. Two feet and 2 inches are—— inches.
15. One yard less 2 inches are —— inches.
16. Think of a line 6 feet long. Six feet are —— yards. Nine feet are —— yards. Twelve feet are —— yards.
17. One yard and 1 foot are —— feet.
18. One yard and 2 feet are —— feet.
19. Seven feet are —— yards and —— foot.
20. Three times 2 feet are —— feet, or —— yards.
21. Two 12's are ——. Three 12's are ——.

(1) Read problems and give differences at sight. (2) Copy and subtract. (3) Tell number stories.*

26	28	29	25	27	30
4	3	6	4	7	2
36	39	37	36	38	40
2	4	2	5	3	2

* Do not omit this part of the work. The number story suggested by the first problem might be:—I had 26 cents; I spent 4 cents; I then had 22 cents.

1. Think of a 2-inch square. Think of a 2-inch square divided into square inches.* A 2-inch square contains ——— square inches.

2. Think of a 3-inch square. Think of a 3-inch square divided into square inches. A 3-inch square contains ——— square inches.

3. Think of an oblong 1 inch wide and 4 inches long. Think of this oblong divided into square inches. Such a figure contains ——— square inches.

4. Think of an oblong 2 inches wide and 4 inches long. Think of this oblong divided into square inches. Such a figure contains ——— square inches.

5. An oblong 3 inches wide and 4 inches long contains ——— square inches.

6. An oblong 2 inches wide and 3 inches long contains ——— square inches.

7. An oblong 2 inches wide and 5 inches long contains ——— square inches.

8. One fourth of a 2-inch square is ——— square inch.

9. One half of a 2-inch square is ——— square inches.

(1) Read problems and give products at sight.† (2) Copy and multiply. (3) Tell number stories. ‡

20	10	12	12	21	22
3	4	2	3	2	2
30	31	32	33	34	35
2	2	2	2	2	2

* If the pupil cannot think how the square and its divisions would appear, it must be drawn; but sometime he must learn to imagine figures *without drawing them*. The strength of the pupil depends very largely upon his skill in making accurate mental pictures from oral and written descriptions. This power must be cultivated from the first.

† Read thus: Three times 20 are 60.

‡ Do not omit this part of the work. The number story suggested by the first problem might be:—One book cost 20 cents; 3 books cost 60 cents.

1. One half of 4 apples is —— apples.
2. Four apples are one half of —— apples.

3. One half of 6 oranges is —— oranges.
4. Six oranges are one half of —— oranges.

5. One half of three toothpicks is ————.
6. Three toothpicks are one half of ————.

7. One half of 5 inches is —— inches.
8. Five inches are one half of —— inches.

9. One half of 7 square inches is ————.
10. One half of 8 square inches is ————.
11. One half of 9 square inches is ————.
12. One half of 10 square inches is ————.
13. One third of three blocks is —— block.
14. Three blocks are one third of —— blocks.

15. One third of 6 balls is —— balls.
16. One third of 9 balls is —— balls.
17. One third of 12 balls is —— balls.
18. One fourth of 8 boys is —— boys.
19. One fourth of 12 boys is —— boys.
20. One fifth of 10 girls is —— girls.
21. Two fifths of 10 girls are —— girls.

$\frac{1}{2}$ of 4 is ——.	4 is $\frac{1}{2}$ of ——.
$\frac{1}{3}$ of 3 is ——.	3 is $\frac{1}{3}$ of ——.
$\frac{1}{5}$ of 5 is ——.	5 is $\frac{1}{5}$ of ——.
$\frac{1}{6}$ of 6 is ——.	6 is $\frac{1}{6}$ of ——.
$\frac{1}{3}$ of 6 is ——.	$\frac{1}{3}$ of 9 is ——.
$\frac{1}{4}$ of 8 is ——.	$\frac{1}{4}$ of 12 is ——.
$\frac{1}{5}$ of 10 is ——.	10 is $\frac{1}{5}$ of ——.
$\frac{1}{6}$ of 12 is ——.	12 is $\frac{1}{6}$ of ——.
$\frac{1}{2}$ of 2 is ——.	2 is $\frac{1}{2}$ of ——.

1. One half of 4 cents is —— cents.
2. Two cents are contained in 4¢ —— times.

3. One half of 6 cents is —— cents.
4. Two cents are contained in 6¢ —— times.

5. One half of 8 cents is —— cents.
6. Two cents are contained in 8¢ —— times.

7. One half of 10 cents is —— cents.
8. Two cents are contained in 10¢ —— times.

9. One half of 12 cents is —— cents.
10. Two cents are contained in 12¢ —— times.

11. One half of 20 cents is —— cents.
12. Two cents are contained in 20¢ —— times.

13. One half of 40 cents is —— cents.
14. Two cents are contained in 40¢ —— times.

15. One half of 60 cents is —— cents.
16. Two cents are contained in 60¢ —— times.

17. One half of 80 cents is —— cents.
18. Two cents are contained in 80¢ —— times.

19. One half of 42 cents is —— cents.
20. Two cents are contained in 42¢ —— times.

(1) Read problems and give quotients at sight.* (2) Copy and divide. (3) Tell number stories.

2)12 2)20 2)40 2)42 2)44 2)48

* Teachers will observe that each of these expressions stands for two problems; the first may mean, *find one half of 12*; or, it may mean, *find how many times 2 is contained in twelve.* Pupils should therefore be required to read them twice; thus, ½ of 12 is 6; 2 is contained in 12 six times. They should also be required to give two number stories for each problem; thus (1), I had 12 apples; I gave my sister ½ of them, or 6 apples; and (2), I had 12 apples which I divided among some girls, giving to each girl 2 apples; there were 6 girls. Vigorous work at this point is essential. The child must see the double nature of these problems. Much time will be saved if he does this in the beginning.

1. Two pints are —— quart.*
2. Six pints are —— quarts.
3. Two quarts are —— pints.
4. Six quarts are —— pints.
5. Four quarts are —— pints.
6. Four pints are —— quarts.
7. Eight pints are —— quarts.
8. Ten pints are —— quarts.
9. Ten quarts are —— pints.
10. Two quarts and 3 quarts are —— quarts.
11. Two quarts and 1 pint, and 2 quarts and 1 pint are —— quarts.
12. Five quarts less 2 quarts are —— quarts.
13. Five quarts less 1 pint are ————.
14. Three times 4 quarts are —— quarts.
15. Two times 3 quarts and 1 pint are ————.
16. Two quarts are contained in 8 quarts —— times.
17. One pint is contained in 3 quarts —— times.
18. One third of 12 quarts is —— quarts.
19. One half of 5 quarts is ————.
20. Mr. Smith sold 1 pint of milk to each of 4 customers; to all he sold —— quarts.
21. At 3 cents a pint, one quart of milk costs —— cents.
22. At 4 cents a quart, one pint of milk costs —— cents.
23. At 4 cents a quart, two quarts and one pint of milk cost —— cents.

* The pupils are supposed to have been prepared for this work while in the second grade. If this has not been done, the teacher should procure the necessary "measures" and proceed to make the child familiar with the terms and relations given on this page *before* allowing him to attempt to read the page.

●●●●●● ●● ●● ●●

1. One third of 6 balls is —— balls.
2. Two thirds of 6 balls are —— balls.

●●●●●●●●● ●●● ●●● ●●●

3. One third of 9 balls is —— balls.
4. Two thirds of 9 balls are —— balls.

5. Arrange 12 balls so that it will be easy to think the number of balls in one third of 12 balls, and the number of balls in two thirds of 12 balls.
6. One third of 12 balls is —— balls.
7. Two thirds of 12 balls are —— balls.

●●●● ●● ●● ○○

8. Four balls are two thirds of —— balls.

●●●●●● ●●● ●●● ○○○

9. Six balls are two thirds of —— balls.

10. Arrange 8 balls so that it will be easy to think the number of balls of which 8 balls are two thirds.
11. Eight balls are two thirds of —— balls.

12. $\frac{1}{3}$ of 6 is ——.	6 is $\frac{1}{3}$ of ——.
13. $\frac{2}{3}$ of 6 are ——.	6 is $\frac{2}{3}$ of ——.
14. $\frac{1}{3}$ of 3 is ——.	3 is $\frac{1}{3}$ of ——.
15. $\frac{2}{3}$ of 9 are ——.	8 is $\frac{2}{3}$ of ——.
16. $\frac{2}{3}$ of 12 are ——.	4 is $\frac{2}{3}$ of ——.

17. Mary paid 6¢ for 2 thirds of a yard of ribbon; at the same rate, 1 yard would cost —— cents.
18. If 1 yard of lace costs 12 cents, 2 thirds of a yard will cost —— cents.
19. If one yard of ribbon costs 9 cents, two thirds of a yard will cost —— cents.

cyclometer bicycle

1. The sum of 7 and 4 is ——.
2. The sum of 20 and 6 is ——.
3. The sum of 21 and 4 is ——.
4. The sum of 32 and 4 is ——.
5. The sum of 43 and 2 is ——.

6. Peter and Harry together had 12 marbles; Harry had 7; Peter had ——.

7. The sum of two numbers is 8; one of the numbers is 5; the other number is ——.

8. Joseph has a new bicycle. There is a cyclometer on it. When Joseph had used the bicycle two days the cyclometer showed that he had ridden 11 miles; he rode 5 miles the first day; the second day he rode —— miles.

9. The sum of two numbers is 10; one of the numbers is 6; the other number is ——.

10. Joseph rode 8 miles in the morning and 4 miles in the afternoon; in all he rode —— miles.

For Drill in Adding.*

6	5	6	4	3	7	8	7	
6	5	1	2	1	5	2	1	
2	3	4	8	9	2	5	5	
1	2	3	1	3	2	1	2	
8	6	6	3	5	5	6	4	
4	4	2	3	4	3	3	1	
6	4	8	9	7	7	9	7	1
5	4	3	2	4	3	1	2	1

* Pupils should be able to give the answers to these primary problems in addition in 33 seconds or less. Do not require them to name the figures; but to give sums only. If pupils memorize them by the order in which they stand, re-arrange them on the blackboard. Continue the drill daily until these problems are mastered.

degrees temperature zero*

1. The difference of 6 and 4 is ——.
2. The difference of 12 and 8 is ——.
3. The difference of 5 and 9 is ——.
4. The difference of 26 and 24 is ——.
5. The difference of 27 and 30 is ——.
6. The difference of 35 and 40 is ——.

7. The temperature at 9 o'clock in the morning was 65 degrees above zero; at noon it was 75; the difference was —— degrees.

8. The temperature inside the schoolroom was 70 degrees above zero; outdoors it was 50; the difference was —— degrees.

9. The temperature at noon was 80 degrees above zero; at 4 o'clock in the afternoon it was 10 degrees lower; at 4 o'clock it was ——.

10. The greater of two numbers is 90; their difference is 10; the less number is ——.

11. The temperature at 10 o'clock was 85 degrees above zero; at noon it was 10 degrees higher; at noon it was ——.

12. The less of two numbers 55; their difference is 10; the greater number is ——.

(1) Read problems and give differences at sight. (2) Copy and subtract. (3) Tell number stories.

80	80	80	80	80	80
20	5	8	10	40	9

* This page should not be attempted until the pupil is familiar with the thermometer and its use. In many schools the subject of temperature is presented in the first grade. Primary pupils will take great interest in a temperature record, and will, with little effort on the part of the teacher, become familiar with this class of problems.

1. The product of 4 and 2 is ——.
2. The product of 6 and 2 is ——.
3. The product of 5 and 2 is ——.
4. The product of 3 and 4 is ——.
5. The product of 3 and 2 is ——.
6. The product of 10 and 2 is ——.
7. The product of 20 and 2 is ——.
8. The product of 10 and 5 is ——.

9. I have an orchard in which there are four rows of trees; in each row there are 10 trees; in all there are —— trees. 4 tens are ——. 5 tens are ——.

10. The length of one side of a 3-inch square is —— inches; the length of all its sides together is —— inches. 4 threes are ——. 3 threes are ——. 2 threes are ——.

11. The product of two numbers is 8; one of the numbers is 2; the other number is ——.

12. The product of two numbers is 40; one of the numbers is 2; the other number is ——.

13. Ten and ten and ten are ——. Three tens are ——. The product of 3 and 10 is ——. Twenty is the product of 10 and ——. Forty is the product of 10 and ——.

(1) Read problems and give products at sight.* (2) Copy and multiply. (3) Tell number stories.

10	20	10	21	10	22
5	4	6	4	7	4
10	30	10	31	40	32
8	3	9	3	2	3

* Review page 13. The problems found near the bottom of pages 13 and 20 are important as an introduction to pencil work in multiplication. The pupil should first be led to see that 2 times 32 are 64; he may then be allowed to obtain this product with the aid of his pencil. In the latter case his thoughts should be somewhat as follows: 2 times 2 are 4; 2 times three (tens) are 6 (tens). Do not require the pupil to do much "explaining" at this stage of the work. Be sure that he *thinks*, and *at first* accept single words and phrases in proof of the correctness of his thought.

1. The quotient of 6 divided by 2 is ——.
2. The quotient of 8 divided by 4 is ——.
3. The quotient of 10 divided by 2 is ——.
4. The quotient of 12 divided by 3 is ——.
5. The quotient of 12 divided by 6 is ——.
6. The quotient of 20 divided by 10 is ——.
7. The quotient of 40 divided by 4 is ——.
8. The quotient of 60 divided by 10 is ——.

9. I have an orchard in which there are 60 trees; these trees are in 6 equal rows; in each row there are —— trees. Sixty divided by 6 equals ——.

10. Edward paid 60 cents for 6 pounds of nuts; one pound cost ——. One sixth of 60 is ——.

11. Byron sold papers for which he received 40 cents; he sold the papers at 2 cents each; he sold —— papers. Two cents are contained in 40 cents —— times.

12. One half of 12 is ——. 2 is contained in 12 —— times.
13. One half of 20 is ——. 2 is contained in 20 —— times.
14. One third of 12 is ——. 3 is contained in 12 —— times.
15. One fourth of 12 is ——. 4 is contained in 12 —— times.
16. One fifth of 10 is ——. 5 is contained in 10 —— times.
17. One half of 60 is ——. 2 is contained in 60 —— times.
18. One half of 80 is ——. 2 is contained in 80 —— times.

(1) Read problems and give quotients at sight.* (2) Copy and divide. (3) Tell number stories.

2)46 3)30 3)33 3)36 3)60 3)63

*See foot-note, page 15. The problems found near the bottom of pages 15 and 21 are important as an introduction to pencil work in division. The pupil should first be led to see that one half of 46 is 23; he may then be allowed to obtain the quotient with the aid of a pencil. In the latter case his thought should be somewhat as follows: One half of 4 (tens) is 2 (tens); one half of 6 is 3. Do not forget the double nature of these problems.

For Review and Drill.*

1. The sum of 6 and 2 is ——.
2. The difference of 6 and 2 is ——.
3. The product of 6 and 2 is ——.
4. The quotient of 6 divided by 2 is ——.

5. The sum of 40 and 20 is ——.
6. The difference of 40 and 20 is ——.
7. The product of 20 and 2 is ——.
8. The quotient of 20 divided by 2 is ——.

9. The sum of 30 and 20 is ——.
10. The difference of 30 and 20 is ——.
11. The product of 30 and 3 is ——.
12. The quotient of 30 divided by 3 is ——.

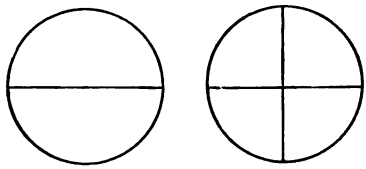
13. The sum of 27 and 3 is ——.
14. The difference of 27 and 3 is ——.
15. The product of 12 and 2 is ——.
16. The quotient of 12 divided by 2 is ——.

17. The sum of 30 and 5 is ——.
18. The difference of 30 and 5 is ——.
19. The product of 10 and 5 is ——.
20. The quotient of 10 divided by 5 is ——.

Add.	Subtract.	Multiply.	Divide.†
22	38	42	2)62
23	21	2	
25	47	23	2)84
24	22	3	

* If the pupil has mastered the preceding pages, he will be able to read this page without much hesitation.

† Read such problems in two ways, as suggested in foot-note on page 15.



1. In one whole there are —— halves.*
2. In one whole there are —— fourths.
3. In one half there are —— fourths.
4. One half and 1 fourth are —— fourths.
5. One half less 1 fourth is —— fourth.
6. Four times 1 fourth are —— fourths, or one ——.
7. One fourth is contained in 1 half —— times.
8. One half of one half is one——.

9. Jane ate one half of a pie; Harold ate one fourth of a pie; together they ate —— —— of a pie.

10. Webb had one half of a pie; he gave one fourth of a pie to his sister: he then had —— —— of a pie.

11. Robert had one fourth of a pie; Arthur had three times as much; Arthur had —— —— of a pie.

12. Mrs. Johnson divided a pie equally among some children, giving to each child one fourth of a pie; there were —— children.

13. Mrs. Clark divided one half of a pie equally between two children; each child received —— —— of a pie.

* By means of diagrams upon the blackboard, teach the necessary number facts *before* the pupil is asked to read this page. Do not at first use the digits in the usual fractional form to represent parts of a unit. Instead of ½, write *1 half*; for ¼, write *1 fourth*, etc.

1. One inch is —— half-inches.
2. One inch is —— fourth-inches.
3. One half-inch is —— fourth-inches.
4. Two half-inches are —— inch.
5. Four fourth-inches are —— inch.
6. Two fourth-inches are —— —— of an inch.
7. One half-inch and 1 fourth-inch are —— fourth-inches.
8. One half-inch less 1 fourth-inch is —— ——.
9. Two times 1 fourth-inch are —— fourth-inches or —— half-inch.
10. One fourth-inch is contained in one half-inch —— times.
11. One half of one half-inch is —— fourth-inch.

12. Alice's pencil is two and one half inches long; Jane's pencil is two and one fourth inches long; together they are —— —— —— —— inches long.
13. Sarah's pencil was two and one fourth inches long; Mary's is three times as long; Mary's pencil is —— —— —— —— inches long.
14. Laura had a pencil two and one half inches long; she broke it into pieces, each piece being one half-inch long; there were —— pieces.
15. Bessie had a pencil two and one half inches long; she broke it into two equal parts; each part was —— —— —— —— inches long.

Add.	Subtract.	Multiply.	Divide.*
1 fourth	3 fourths	2 fourths	2 fourths) 4 fourths
3 fourths	1 fourth	2	

* Read this problem in only one way; thus, *2 fourths are contained in 4 fourths two times.*

1. One dollar is equal in value to —— half-dollars.

2. One dollar is equal in value to —— fourth-dollars.

3. One half-dollar is equal in value to —— fourth-dollars. A fourth-dollar is sometimes called a "quarter," or a *quarter of a dollar.*

4. One half of a dollar and one fourth of a dollar are —— fourths of a dollar.

5. One half of a dollar less one fourth of a dollar is —— —— of a dollar.

6. Four times one fourth of a dollar equals —— fourths of a dollar, or —— dollar.

7. One fourth of a dollar is contained in one half of a dollar —— times.

8. One half of one half of a dollar is —— —— of a dollar.

9. Peter paid half of a dollar for a book and a quarter of a dollar for a slate; for both he paid —— —— of a dollar, or —— cents.

10. Fred bought a knife; the price was half a dollar; he gave the salesman one dollar; Fred should receive in change ————.

11. At a quarter of a dollar a pound, 4 pounds of coffee cost ————.

12. I paid half a dollar for butter at one fourth of a dollar a pound; I bought —— pounds.

1. In 6 there are —— twos.
2. In 7 there are —— twos and —— remainder.
3. In 8 there are —— twos.
4. In 9 there are —— twos and —— remainder.
5. In 10 there are —— twos.
6. In 11 there are —— twos and —— remainder.
7. In 8 there are —— fours.
8. In 9 there are —— fours and —— remainder.
9. In 10 there are —— fours and —— remainder.
10. In 11 there are —— fours and —— remainder.
11. In 10 there are —— fives.
12. In 12 there are —— fives and —— remainder.
13. In 9 there are —— threes.
14. In 11 there are —— threes and —— remainder.
15. In 23 there are —— tens and —— remainder.
16. In 35 there are —— tens and —— remainder.
17. In 21 there are —— twos and —— remainder.
18. In 41 there are —— twos and —— remainder.

19. One half of 20 is ——. One half of 21 is ——.
20. One half of 40 is ——. One half of 41 is ——.

21. One third of 30 is ——. One third of 31 is ——.
22. One third of 60 is ——. One third of 61 is ——.

(1) Read problems and give quotients at sight.* (2) Copy and divide. (3) Tell number stories.

4)12	4)40	4)44	4)48	5)50	5)55
3)66	3)69	3)90	3)93	3)96	3)99

* See foot-notes, pages 15 and 21.

1. Six apples and 3 apples are —— apples.
2. Seven apples less 2 apples are —— apples.
3. Three times 2 apples are —— apples.
4. Three apples are contained in 9 apples —— times.
5. One half of 7 apples is —— apples.

6. Eight cents and 3 cents are —— cents.
7. Nine cents less 2 cents are —— cents.
8. Four times 3 cents are —— cents.
9. Four cents are contained in 12 cents —— times.
10. One third of 12 cents is —— cents.

11. Twenty trees and 7 trees are —— trees.
12. Twenty trees less 2 trees are —— trees.
13. Two times 20 trees are —— trees.
14. Two trees are contained in 40 trees —— times.
15. One half of 60 trees is —— trees.

16. Sixty-eight degrees and 4 degrees are ——.
17. Sixty-eight degrees less 4 degrees are ——.
18. Four times 20 degrees are —— degrees.
19. Two degrees are contained in 12 degrees —— times.
20. One third of 30 degrees is —— degrees.

(1) Read problems and give sums at sight.* (2) Copy and add. (3) Tell number stories.

27	36	39	55	47	34
3	4	1	5	3	6
29	39	59	49	48	28
2	2	2	2	3	3

* The problems found near the bottom of pages 11 and 27 are important as an introduction to pencil work in addition. The pupil should first be led to see that 27 and 3 are 30; that 28 and 3 are 31, etc. He may then be taught to obtain these sums with the aid of a pencil, adding and "carrying" in the usual manner.

1. John had 22 cents, and his mother gave him 5 cents more; he then had ——— cents.

2. William had 36 cents; he spent 5 cents; he then had ——— cents.

3. David paid 20 cents each for 2 books; the books cost ——— cents.

4. George paid 50 cents for some tablets; the price of the tablets was 10 cents each; there were ——— tablets.

5. Harry's new drawing pencils cost 40 cents; there were 4 of them; each pencil cost ——— cents.

6. In one coop there were 21 little chickens; in another coop there were 8; in both there were ——— chickens.

7. Susan had 36 chickens; 4 of them died; she then had ——— chickens.

8. In each of three coops there were 20 chickens; in all there were ——— chickens.

9. Mrs. Brown has 36 chickens equally divided among 3 mother hens; each hen cares for ——— chickens.

10. Mrs. Harris had 30 chickens; she divided them equally and put them into 3 coops; in each coop there were ——— chickens.

(1) Read problems and give differences at sight.* (2) Copy and subtract. (3) Tell number stories.

30	20	30	20	30	20
2	2	3	3	4	4

* The problems found near the bottom of pages 12 and 28 are important as an introduction to pencil work in subtraction. The pupil should first be led to see that 30 less 2 are 28; that 20 less 4 are 16, etc. He may then be taught to obtain these differences with the aid of a pencil in the usual manner. A large number of problems similar to those found on pages 11, 12, 13, 15, 19, 20, 21, 22, 26, 27 and 28 should be given by the teacher.

1. If 1 quart of milk is worth 6 cents, 1 pint is worth —— cents.

2. When milk costs 4 cents a quart, 1 pint costs —— cents; 1 quart and 1 pint cost —— cents; 2 quarts cost —— cents; 2 quarts and 1 pint cost —— cents.

3. When milk costs 6 cents a quart, 9 cents will pay for ————.

4. When milk costs 4 cents a quart, 6 cents will pay for ————; 10 cents will pay for ————; 12 cents will pay for ————.

5. When milk costs 6 cents a quart, 12 cents will pay for ————.

6. Herbert paid 6 cents for a ball, and half as many cents for an orange; the orange cost —— cents; the orange and the ball together cost ————. The sum of 6 and 3 is ——.

7. Four two-cent stamps cost —— cents.

8. George had 11 cents; he bought 3 two-cent stamps; he then had —— cents.

9. My pen-holder cost 8 cents; my pencil cost half as much as my pen-holder; my pencil cost —— cents; my pen-holder and pencil together cost —— cents.

Two is one fourth of ——.	2 is one third of ——.
Four is —— —— of eight.	4 is one third of —— .
Six is —— of eight.	6 is one half of —— .
Three is one fourth of ——.	3 is one half of ——.
Six is —— —— of twelve.	5 is —— —— of 10.
Nine is —— —— of twelve.	8 is two thirds of ——.

1. William had six cents; he paid one third of his money for a tablet; he then had —— cents.*

2. Jane had six cents; she paid two thirds of her money for an orange; she then had —— cents.

3. Henry earned some money; he spent one half of what he earned and had 5 cents left; he earned —— cents; he spent —— cents.

4. James earned some money; he spent two thirds of what he earned and had 3 cents left; he earned —— cents; he spent —— cents.

5. Peter earned some money; he spent one third of what he earned and had 6 cents left; he earned —— cents; he spent —— cents.

6. A hen came off her nest with a nice brood of chicks; but there came a rain storm and three fourths of them were drowned; the poor hen then had only three chicks; she came off her nest with —— chicks; the rain killed —— chicks.

7. Mary had a whole family of dolls; she gave away three fourths of them and had only 2 dolls left; before she gave any away she had —— dolls; she gave away —— dolls.

3 cents are $\frac{1}{3}$ of —— cents.
6 cents are $\frac{2}{3}$ of —— cents.

3 chicks are $\frac{1}{4}$ of —— chicks.
9 chicks are $\frac{3}{4}$ of —— chicks.

2 dolls are $\frac{1}{4}$ of —— dolls.
6 dolls are $\frac{3}{4}$ of —— dolls.

* In preparation for this page, review page 17.

(1) Read problems and give sums at sight.* (2) Copy and add. (3) Tell number stories.

Exercise I.

20	30	40	50	60	70
12	12	12	12	12	12
21	31	41	51	61	71
12	12	12	12	12	12
20	30	40	50	60	70
11	11	11	11	11	11
21	31	41	51	61	71
11	11	11	11	11	11

Exercise II.

22	32	42	52	62	72
12	12	12	12	12	12
23	33	43	53	63	73
11	11	11	11	11	11
20	30	40	50	60	70
13	13	13	13	13	13
21	31	41	51	61	71
13	13	13	13	13	13

* Lead the pupil to think 11, as 10 and 1; 12, as 10 and 2, etc. Teach him to add as indicated in the following: Teacher. 23 and 12? Pupil. 23, 33, 35. Then lead him to see that the usual method of adding with the aid of the pencil, will give the same result.

(1) Read problems and give sums at sight.* (2) Copy and add. (3) Tell number stories.

Exercise III.

25	35	35	45	45	55
25	35	25	25	35	25
25	35	35	25	35	35
26	36	26	27	37	27
24	34	34	44	44	54
26	36	26	26	36	26
24	34	34	44	44	54
27	37	27	27	37	27

Exercise IV.

23	33	33	43	43	53
27	37	27	27	37	27
23	33	33	43	43	53
28	38	28	28	38	28
22	32	32	42	42	52
28	38	28	28	38	28
22	32	32	42	42	52
29	39	29	29	39	29

* Lead the pupil to think 25 as 2 tens and 5; 26 as 2 tens and 6, etc. See footnote, page 31. Teach the pupil to add as indicated in the following: Teacher. 25 and 23? Pupil. 20, 40, 50, 51. Then lead him to see that the usual way of adding with the aid of the pencil, will give the same result.

(1) Read problems and give differences at sight.* (2) Copy and subtract. (3) Tell number stories.

Exercise V.

29	38	49	58	69	78
10	10	10	10	10	10
29	38	49	58	69	78
11	11	11	11	11	11
29	38	49	58	69	78
12	12	12	12	12	12
29	38	49	58	69	78
13	13	13	13	13	13

Exercise VI.

28	37	48	57	68	77
12	12	12	12	12	12
28	37	48	57	68	77
13	13	13	13	13	13
26	35	46	55	66	75
12	12	12	12	12	12
26	35	46	55	66	75
13	13	13	13	13	13

* Teach the pupil to subtract as indicated in the following: Teacher. 38 less 12? Pupil. 33, 28, 26. Then lead him to see that the usual method of subtracting with the aid of a pencil will give the same result.

(1) Read problems and give differences at sight.* (2) Copy and subtract. (3) Tell number stories.

Exercise VII.

32	42	52	42	52	62
12	12	12	22	22	22
30	40	50	60	70	80
12	12	12	12	12	12
30	40	50	60	70	80
13	13	13	13	13	13
30	40	50	60	70	80
14	14	14	14	14	14

Exercise VIII.

31	41	51	41	51	61
13	13	13	13	13	13
32	42	52	42	52	62
13	13	14	14	14	14
32	42	52	42	52	62
14	14	24	24	14	24
31	41	51	41	51	61
16	26	26	26	26	26

* Teach the pupil to subtract as indicated in the following: Teacher. 32 less 14? Pupil. 32, 22, 20, 18. Then lead him to see that the usual method of subtracting with the aid of the pencil, will give the same result.

(1) Read problems and give products.* (2) Copy and multiply. (3) Tell number stories.

Exercise IX.

21	22	23	24	25	26
2	2	2	2	2	2
10	20	30	40	50	60
2	2	2	2	2	2
12	22	32	42	52	62
2	2	2	2	2	2
13	23	33	43	53	63
2	2	2	2	2	2

Exercise X.

14	24	34	44	54	64
2	2	2	2	2	2
15	25	35	45	55	65
2	2	2	2	2	2
16	26	36	46	56	66
2	2	2	2	2	2
13	14	23	24	33	34
3	3	3	3	3	3

*Teach the pupil to multiply as indicated in the following: Teacher. 2 times 26? Pupil. 2 times 20 are 40; 2 times 6 are 12; 40 and 12 are 52. Do not require the pupil to talk much until you have reason to believe that he thinks that which you desire to have expressed. Let him give the answers to many, many questions like the preceding before he is required to "explain." When he can easily obtain correct answers by the method herein suggested, lead him to see that the usual method of multiplying with the aid of a pencil, will give the same result.

(1) Read problems and give quotients.* (2) Copy and divide. (3) Tell number stories.

Exercise XI.

2)20	2)30	2)40	2)50	2)60	2)70
2)22	2)32	2)42	2)52	2)62	2)72

1. I obtain a sum by ——.
2. I obtain a difference by ——.
3. I obtain a product by ——.
4. I obtain a quotient by ——.

5. The answer in addition is a — .
6. The answer in subtraction is a ——.
7. The answer in multiplication is a ——.
8. The answer in division is a ——.

9. The sum of 8 and 2 is ——.
10. The difference of 8 and 2 is ——.
11. The product of 8 and 2 is —— .
12. The quotient of 8 divided by 2 is —.

13. When I put two numbers together, I ——.
14. When I take one number from another, I ——.
15. When I take a number a certain number of times, I ——.
16. When I find how many times one number is contained in another, I ——.
17. When I find a certain part of a number, as one half of it, or one third of it, or one fourth of it, I ——.

* Observe the double nature of these problems. Require pupils to read each problem in two ways. See foot-note, page 15, and problems on page 21.

1. 2)6 *

Two apples are contained in 6 apples —— ——.
One half of 6 apples is —— ——.

2. 3)12

Three dollars are contained in 12 dollars —— ——.
One third of 12 dollars is —— ——.

3. 4)12

Four cents are contained in 12 cents —— ——.
One fourth of 12 cents is —— ——.

4. 5)10

Five oranges are contained in 10 oranges —— ——.
One fifth of 10 oranges is —— ——.

5. 6)12

Six inches are contained in 12 inches —— ——.
One sixth of 12 inches is —— ——.

6. 4)40

Four cents are contained in 40 cents —— ——.
One fourth of 40 cents is —— ——.

7. 2)24

Two peaches are contained in 24 peaches —— ——.
One half of 24 peaches is —— ——.

8. 3)69

Three quarts are contained in 69 quarts —— ——
One third of 69 quarts is —— ——.

*This page is designed to impress upon pupils the double nature of abstract problems in division.

Review.

1. One half of 1 quart is ——— ———.
2. One half of 1 foot is —— inches.
3. One half of 1 yard is ———————.
4. One half of 1 dollar is ——— cents.
5. One half of 1 dime is ———————.
6. One half of 7 quarts is ———————.
7. One half of a 2-inch square is ———————.*
8. One half of a 3-inch square is ———————.*
9. One half of 5 feet is ———————.
10. One half of an oblong 2 inches by 4 inches is ——— ———————.*

11. Two quarts are one third of ——— ———.
12. Four inches are one third of ———————.
13. One foot is one third of ——— ———.
14. Three inches are one fourth of ———————.
15. Twenty-five cents are one fourth of ——— ———.
16. One pint is one fourth of ——— ———.
17. One dime is one third of ——— ———.
18. One quart is one fourth of ——— ———.

19. One half of a foot and one fourth of a foot are ——— inches.

20. One half of a dollar and one fourth of a dollar are ——— cents.

21. One half of a pie and one fourth of a pie are ——— fourths of a pie.

22. One half of an inch and one fourth of an inch are ——— fourths of an ———.

23. One half of a square inch and one fourth of a square inch are ——— fourths of a square inch.

* Review page 13, if necessary.

imagine vertical* horizontal*

1. Imagine 12 marks on the blackboard; then imagine that you erase half of them; then imagine that you erase one half of the remainder. How many marks do you now seem to see upon the blackboard?

2. Imagine a 4-inch square drawn upon the blackboard; imagine it divided into equal parts by a vertical line; also imagine a horizontal line that would divide the square into two equal parts. Into how many equal parts does the square now seem to be divided? Each part is what kind of a square? How many 2-inch squares in a 4-inch square?

3. Imagine a 1-inch square drawn upon your slate. It has how many sides? Each side is how long? How far is it around a 1-inch square?

4. Imagine a 2-inch square drawn upon the blackboard. It has how many sides? Each side is how long? How far is it around a 2-inch square?

5. Imagine that you have a stick of candy 1 foot long; imagine that you give one third of it to your brother; imagine that you break the remainder into two equal pieces. How many inches long is each piece?

6. Imagine an oblong bounded by two vertical lines each 1 inch long, and two horizontal lines each 3 inches long. How many such oblongs would be equal to a 3-inch square?

7. Imagine four 1-inch squares cut from paper. So arrange them that they together will make a square. What kind of a square is it?

8. Imagine nine 1-inch squares cut from paper. So arrange them that they together will make a square. What kind of a square is it?

* Teach the meaning and use of the words vertical and horizontal.

THIRD GRADE. PART II.

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THIRD GRADE. PART II.

Three number facts to be memorized.*

9	8	7
4	5	6
13	13	13

1. Nine and 4 are ——. 8 and 4 are ——.
2. Seven and 5 are ——. 8 and 5 are ——.
3. Nine and 3 are ——. 6 and 5 are ——.
4. Seven and 6 are ——. 7 and 4 are ——.

5. Thirteen less 9 are ——. 13 less 7 are ——.
6. Thirteen less 8 are ——. 13 less 4 are ——.
7. Thirteen less 6 are ——. 13 less 5 are ——.

8. 13 is 2 6's and ——. 13 is 2 5's and ——.
9. 13 is 3 4's and ——. 13 is 4 3's and ——.

10. Twelve units or ones make one dozen.
11. Thirteen is one dozen and ——.
12. Thirteen inches are 1 foot and —— inch.
13. Thirteen cents are 1 dime and —— cents.
14. Thirteen days are one week and —— days.
15. Thirteen pints are 6 quarts and —— pint.
16. Thirteen feet are 4 yards and —— foot.

* Teach orally the three number facts here given. Use objects if necessary. Be sure that the pupil first perceives then memorizes these facts. If this work is properly done, the corresponding facts of subtraction will be learned almost without effort. The pupil who perceives and remembers that 9 and 4 are 13 will, at the same time, perceive and remember that 13 less 4 are 9, and that 13 less 9 are 4.

1. Seven quarts of milk and 6 quarts of milk are —— quarts of milk.

2. Eight pounds of sugar and 4 pounds of sugar are —— pounds of sugar.

3. Twelve loads of gravel less 7 loads of gravel are —— loads of gravel.

4. Thirteen pairs of horses less 6 pairs of horses are —— pairs of horses.

5. Three times 4 books are —— books.

6. Two times 6 birds are —— birds.

7. Three inches are contained in 12 inches —— times.

8. Three inches are contained in 13 inches —— times with one inch remainder.

9. One third of 12 inches is —— inches.

10. One third of 13 inches is —— and —— —— inches.

11. Four inches are contained in 12 inches —— times.

12. Four inches are contained in 13 inches —— times with —— inch remainder.

13. One fourth of 12 inches is —— inches.

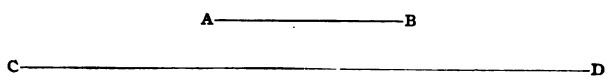
14. One fourth of 13 inches is —— and —— —— inches.

15. Five inches are contained in 10 inches —— times.

16. Five inches are contained in 13 inches —— times with —— inches remainder.

17. One fifth of 10 inches is —— inches.

18. One fifth of 13 inches is —— and —— —— inches.



1. The line A B is —— —— long.
2. The line C D is —— inches long.
3. How many inches longer is C D than A B? C D is —— inches longer than A B.
4. A B and C D together are —— inches long.
5. C D is how many times as long as A B? C D is —— times as long as A B.
6. A B is equal to what part of C D? A B is equal to —— —— of C D.

---

7. The sum of 8 and 5 is —— .
8. The difference of 8 and 5 is —— .
9. The product of 40 and 2 is —— .
10. The quotient of 8 divided by 2 is —— .
11. The sum of two numbers is 13; one of the numbers is 9; the other number is —— .
12. The difference of two numbers is 5; the greater number is 13; the less number is —— .
13. The difference of two numbers is 4; the less number is 9; the greater number is —— .
14. Think of an oblong 2 inches wide and 6 inches long. Think of this oblong divided into 1-inch squares. There are two rows of 1-inch squares. In each row there are —— 1-inch squares. In both rows there are —— 1-inch squares. Two times 6 squares are —— squares.

1. Mary had 13 canaries; she sold 8 of them; she then had —— canaries.

2. Henry lives 9 miles north of Aurora; James lives 4 miles south of Aurora; from Henry's home to James's home it is —— miles.

3. William had 13 cents; he bought two oranges at 5 cents each; he then had —— cents.

4. A ton of coal cost 6 dollars; a cord of wood cost 4 dollars; the coal cost —— dollars more than the wood; the wood and coal together cost —— dollars.

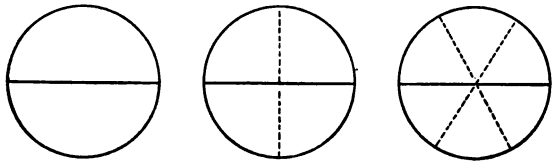
5. Robert is 8 years old and his sister is 5 years older than he is; Robert's sister is —— years old.

6. John gathered 13 roses and gave 6 of them to his sister; he kept —— roses.

(1) Read problems and give sums.* (2) Copy and add. (3) Tell number stories.

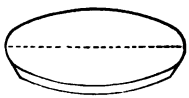
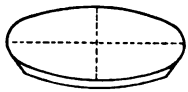
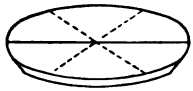
120	123	128	121	125
10	10	10	20	20
128	127	129	122	125
4	6	2	9	8
122	123	121	124	125
12	13	14	15	12
128	127	128	127	126
12	13	14	15	17

*Help the pupil to think in the order and manner suggested by the following: Teacher. 122 and 12? Pupil. 122, 132, 134. Teacher. 128 and 14? Pupil. 128, 138, 140, 142. Teach orally the reading and the writing of integers represented by three figures. See foot-note, page 27.



1. One whole is —— fourths.*
2. One whole is —— sixths.
3. One half is how many fourths? One half is —— fourths.
4. One half is how many sixths? One half is —— sixths.
5. One half and one fourth are —— fourths.
6. One half and one sixth are —— sixths.
7. One half and two sixths are —— sixths.
8. One half less one fourth is —— fourth.
9. One half less one sixth are —— sixths.
10. One half less two sixths is —— sixth.
11. Two times one fourth are —— fourths.
12. Two times one sixth are —— sixths.
13. Three times one sixth are —— sixths.
14. Two times two sixths are —— sixths.
15. Three times two sixths are —— sixths.
16. One fourth is contained in 1 half —— times.
17. One sixth is contained in 1 half —— times.
18. Two sixths are contained in 1 whole —— times.
19. One half of one half is —— ——.
20. One third of one half is —— ——.

* Teach orally the facts given on this page before the pupil is asked to read it. Put diagrams on the blackboard and continue the oral work until the pupil can easily think one half, one fourth, one sixth, etc., when the words that should suggest these are spoken.

1. One half of a pie and one fourth of a pie are —— fourths of a pie.

2. One half of a pie and one sixth of a pie are —— sixths of a pie.

3. One half of a pie less one fourth of a pie is —— fourth of a pie.

4. One half of a pie less one sixth of a pie are —— sixths of a pie.

5. Three times 2 sixths of a pie are ————.

6. Two sixths of a pie are contained in one whole pie —— times.

7. One third of one half of a pie is —— —— of a pie.

8. James ate one half of a pie; Harold ate one sixth of a pie; together they ate —— —— of a pie.

9. Webb had one half of a pie; he gave one sixth of a pie to his sister; he then had —— —— of a pie.

10. Robert had one sixth of a pie; Arthur had three times as much; Arthur had ————————.

11. Mrs. Johnson divided a pie equally among some children, giving to each child one sixth of a pie; there were —— children.

12. Mrs. Clark divided one half of a pie equally among three children; each child received —— —— of a pie.

4 quarts are 1 gallon.*

1. Four quarts are —— gallon.
2. Eight quarts are —— gallons.
3. Twelve quarts are —— gallons.
4. Two gallons are —— quarts.
5. Two quarts are —— —— of a gallon.
6. Three quarts are —— —— of a gallon.
7. Five quarts are —— and —— —— gallons.
8. Six quarts are —— and —— —— gallons.
9. Seven quarts are —— and —— —— gallons.
10. One quart is —— pints.
11. One gallon is —— pints.
12. Twelve pints are quarts.
13. Twelve pints are —— and —— —— gallons.
14. At 5 cents a quart, one half-gallon of milk costs —— cents.
15. At 12 cents a gallon, two quarts of milk cost —— cents.
16. At 40 cents a gallon, two quarts of syrup cost —— cents.
17. At 20 cents a quart, one half-gallon of lard oil costs —— cents.
18. At 12 cents a gallon, one quart of kerosene costs —— cents.
19. At 2 cents a quart, one gallon of skimmed milk costs —— cents.
20. One gallon and three quarts are —— quarts.

* Use the "measures" and take care that the pupil clearly understands and perfectly memorizes this fact.

Seven days = 1 week.

1. One quart and one pint are – pints.
2. One gallon and one quart are —— quarts.
3. One foot and one inch are —— inches.
4. One yard and one foot are —— feet.
5. One dime and one cent are – cents.
6. One half and one fourth are —— fourths.
7. One half and one sixth are —— sixths.
8. One nickel and one cent are —— cents.

9. Will Blake carried to Mr. Jones a pint of milk each day for two weeks; in all he carried – pints, or —— quarts, or one gallon and —— quarts.

10. Mrs. Bean buys two quarts of milk each day, for which she pays 5 cents a quart; each day the milk costs cents; for one week the milk costs —— cents.

(1) Read, and give differences.* (2) Copy and subtract. (3) Tell number stories.

129	127	128	126	125
4	5	6	4	3
130	140	150	160	170
4	5	6	7	8
132	133	144	155	166
12	13	14	15	16
130	140	150	160	170
12	12	12	12	12

* Help the pupil to think in the order and manner suggested by the following: Teacher. 132 less 12? Pupil. 132, 122, 120. Teacher. 140 less 12? Pupil. 140, 130, 128.

1. Nine books and four books are —— books.

2. Six apples and five apples are —— apples.

3. My book is —— inches wide.

4. If I should draw an oblong 3 inches wide and 4 inches long, and then divide it into 1-inch squares, there would be —— rows of squares, and in each row there would be —— squares. An oblong 3 inches by 4 inches contains —— square inches.

5. Three times 4 square inches are —— square inches.

6. Four times 3 square inches are —— square inches.

7. Henry is 13 years old; his sister is 8 years old; Henry is —— years older than his sister.

8. Jane had a piece of ribbon 13 inches long; she cut from it pieces 3 inches long; when she had cut off 4 pieces, she had —— —— left.

9. Thirteen is 10 and ——. 12 is 10 and ——.

10. Eleven is 10 and ——. 13 is 8 and ——.

11. One half of 12 is ——. One half of 13 is ——.

12. One third of 12 is ——. One third of 9 is ——.

13. Byron pays 2 cents each for oranges, and sells them for 4 cents each; on 1 orange he gains —— cents; on 6 oranges he gains —— cents.

14. Harry pays 10 cents a dozen for eggs and sells them at 13 cents a dozen; on 1 dozen he gains —— cents; on 4 dozen he gains —— cents.

15. Ten days are one week and —— days.

16. To-day is Monday. Seven days from to-day will be ——. Eight days from to-day will be ——.

17. An old hen sat upon 13 eggs; all the eggs hatched except 4; there were —— chickens.

Review.

1. Howard has a string 2 and 1 half feet long; David has a string 2 and 1 fourth feet long; together the strings are —— and — fourths feet long.

2. Draw an oblong 2 and 1 half inches wide; make it twice as long as it is wide; it will be —— inches long.

3. The teacher bought 2 and 1 half yards of ribbon; she cut it into pieces 1 fourth of a yard long; there were —— pieces.

4. Mary had a stick of molasses candy 1 and 1 half feet long; she cut it into pieces 1 sixth of a foot long; there were —— pieces.

5. One half of 2 and 1 half inches is ————.

6. One third of 6 and 1 half inches is ————.

7. Ellen had a piece of ribbon 1 half of a yard long; Sarah had a piece 1 sixth of a yard long; together they had —— —— of a yard.

8. Emma lives 1 half of a mile north of the schoolhouse; Eva lives one fourth of a mile south of the schoolhouse; from Emma's home to Eva's home it is —— —— of a mile.

9. The cyclometer on Willie's bicycle showed that he had ridden 10 and 1 half miles; James had ridden twice as far; James had ridden —— miles.

(1) Read, and give sums. (2) Copy and add. (3) Tell number stories.

$26\frac{1}{2}$	$22\frac{1}{2}$	$23\frac{1}{2}$	$25\frac{1}{4}$	$21\frac{1}{4}$
$2\frac{1}{2}$	$5\frac{1}{4}$	$4\frac{1}{8}$	$3\frac{1}{4}$	$3\frac{3}{4}$

(1) Read, and give differences. (2) Copy and subtract. (3) Tell number stories.

$24\frac{1}{2}$	$28\frac{1}{2}$	27	25	29
$2\frac{1}{4}$	$3\frac{1}{8}$	$2\frac{1}{2}$	$3\frac{1}{4}$	$6\frac{1}{8}$

Five number facts to be memorized.*

9	8	7	
5	6	7	7 twos are 14
14	14	14	2 sevens are 14.

1. Nine and 5 are ——. 8 and 5 are ——.
2. Seven and 6 are ——. 7 and 7 are ——.
3. Seven and 5 are ——. 8 and 6 are ——.

4. Fourteen less 9 are ——. 14 less 7 are ——.
5. Fourteen less 5 are ——. 14 less 8 are ——.
6. Fourteen less 6 are ——. 14 less 10 are ——.
7. Fourteen less 12 are ——. 14 less 11 are .
8. Fourteen less 4 are ——. 14 less 2 are ——.

9. 14 is —— 7's. 14 is —— 2's.
10. 14 is 3 4's and ——. 14 is 4 3's and ——.
11. 14 is 2 5's and ——. 14 is 2 6's and ——.

12. Fourteen is one dozen and ——.
13. Fourteen inches are 1 foot and —— inches.
14. Fourteen cents are 1 dime and —— cents.
15. Fourteen days are —— weeks.
16. Fourteen pints are —— quarts.
17. Fourteen quarts are —— pints.
18. Fourteen feet are 3 yards and —— feet.
19. Fourteen quarts are 3 gallons and —— quarts.
20. Fourteen eggs are 1 dozen and —— eggs.
21. Fourteen cents are 2 nickels and —— cents.
22. Fourteen sixths are 2 wholes and —— sixths.
23. Fourteen fourths are 3 wholes and —— fourths.

* See foot-note, p. 41.

1. Eight gallons of milk and 6 gallons of milk are —— gallons of milk.

2. Nine pairs of ponies and 4 pairs of ponies are —— pairs of ponies.

3. Fourteen loads of hay less 9 loads of hay are —— loads of hay.

4. Fourteen boxes of berries less 8 boxes of berries are —— boxes of berries.

5. Two times 7 marbles are —— marbles.

6. Seven times 2 horses are —— horses.

7. Seven inches are contained in 14 inches —— times.

8. Two inches are contained in 14 inches —— times.

9. Six inches are contained in 14 inches —— times with a remainder of —— inches.

10. Five inches are contained in 14 inches —— times with a remainder of —— inches.

11. Four inches are contained in 14 inches —— times with a remainder of —— inches.

12. Three inches are contained in 14 inches —— times with a remainder of —— inches.

13. One half of 14 inches is —— inches.

14. One seventh of fourteen inches is —— inches.

15. Three sevenths of 14 inches are inches.

16. Two sevenths of 14 inches are —— inches.

17. Five sevenths of 14 inches are —— inches.

18. Clyde had 14 cents; he spent 4 sevenths of his money; he spent —— cents and had —— cents left.

19. Three sevenths of 14 cents are one half of —— cents.

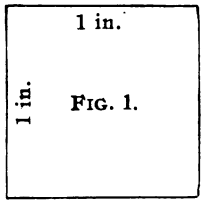


FIG. 1.

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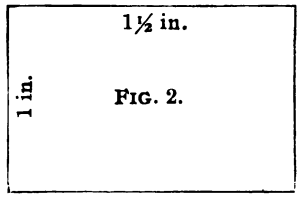


FIG. 2.

1. The distance around a figure is called its *perimeter.*
2. The perimeter of a 1-inch square is —— inches.
3. The perimeter of a 2-inch square is —— inches.
4. The perimeter of a 3-inch square is —— inches.
5. The perimeter of Fig. 2, at the beginning of this page, is —— inches.
6. Draw a square whose perimeter is 40 inches. It is a —— inch square.

7. The sum of 9 and 5 is ——.
8. The difference of 14 and 9 is ——.
9. The product of 7 and 2 is ——.
10. The quotient of 140 divided by 2 is ——.

11. The sum of two numbers is 14; one of the numbers is 8; the other number is ——.
12. The difference of two numbers is 4; the less number is 10; the greater number is ——.
13. The difference of two numbers is 5; the greater number is 14; the less number is ——.

14. Imagine an oblong 2 inches wide and 5 inches long. Imagine this divided into 1-inch squares. There are two rows of 1-inch squares. In each row there are —— 1-inch squares. In both rows there are —— 1-inch squares. Two times 5 squares are —— squares.

* Teach orally the meaning and use of the word *perimeter.*

1. A hen had 14 chickens; a hawk killed 6 of them; she then had ——— chickens.

2. Peter lives 5 miles west of Aurora; his cousin lives 14 miles west of Aurora; from Peter's home to his cousin's it is ——— miles. Peter lives ——— of his cousin.†

3. At 7 cents each, 2 melons cost ——— cents.

4. Charles pays 3 cents a bag for pop-corn and sells it at 5 cents a bag; on one bag he gains ——— cents; on 3 bags he gains ——— cents.

5. When oranges cost 2 cents each, for 14 cents I can buy ———oranges.

6. Willie paid 70 cents each for two books; for both he paid ——————— .

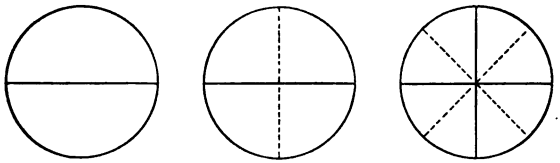
7. I paid 1 dollar and 20 cents (120¢) for 2 yards of lace; one yard cost ——— cents.

(1) Read, and give products.* (2) Copy and multiply. (3) Tell number stories.

103	104	105	106	107
2	2	2	2	2
122	123	124	132	133
2	2	2	2	2
115	125	135	145	126
2	2	2	2	2
101	102	103	104	103
3	3	3	3	4

* Help the pupil to think in the order and manner suggested by the following: Teacher. 125 multiplied by 2? Pupil. 200, 240, 250. Teacher. 126 multiplied by 2? Pupil. 200, 240, 250, 252.

† East or west.

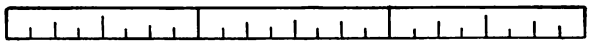


1. One whole is —— eighths.
2. One half is —— eighths.
3. One fourth is —— eighths.
4. Three fourths are —— eighths.
5. One half and one eighth are —— eighths.
6. One fourth and one eighth are —— eighths.
7. One half and two eighths are —— eighths.
8. One fourth and two eighths are —— eighths.
9. One half and three eighths are —— eighths.
10. One fourth and three eighths are —— eighths.
11. Three fourths and one eighth are —— eighths.

12. One half less one eighth are —— eighths.
13. One fourth less one eighth is —— eighth.
14. Three fourths less one eighth are —— eighths.
15. One half less three eighths is —— eighth.
16. Three fourths less three eights are —— eighths.

17. Two times one eighth are —— eighths.
18. Two times two eighths are —— eighths.
19. Two times three eighths are —— eighths.
20. One eighth is contained in one half —— times.
21. One eighth is contained in one fourth —— times.
22. One eighth is contained in three fourths ————.
23. Two eighths are contained in three fourths —— .
24. One half of one fourth is —— eighth.

Review page 45. See foot-note, page 45. If the pupil is unable to fill the blanks promptly, do more oral work, using diagrams upon the blackboard. The learner must *perceive* that ⅛ and ⅛ are ⅝; that ¼ and ⅛ are ⅜, etc.



1. One half of an inch and one eighth of an inch are —— eighths of an inch.

2. One fourth of an inch and one eighth of an inch are —— eighths of an inch.

3. Three fourths of an inch and one eighth of an inch are —— eighths of an inch.

4. One inch less one eighth of an inch are —— eighths of an inch.

5. One half of an inch less one eighth of an inch are —— eighths of an inch.

6. One fourth of an inch less one eighth of an inch is —— eighth of an inch.

7. Three fourths of an inch less one eighth of an inch are —— eighths of an inch.

8. Three times three eighths of an inch are ————.

9. Two times five eighths of an inch are ————.

10. Four times three eighths of an inch are ————.

11. Three eighths of an inch are contained in one and one eighth inches (9 eighths) —— times.

12. Three eighths of an inch are contained in one and one half inches —— times.

13. One half of one fourth of an inch is ————.

14. One half of three fourths of an inch is ————.

15. Johnnie had a splinter in his finger one fourth of an inch long. In getting it out his mother broke it into two equal pieces. Each piece was —— —— of an inch long. Johnnie cried.

Two number facts to be memorized.*

8 quarts are 1 peck.
4 pecks are 1 bushel.

1. Eight quarts are one ——.
2. Twelve quarts are —— and —— —— pecks.
3. Four pecks are one ——.
4. Eight pecks are —— bushels.
5. Twelve pecks are —— bushels.
6. One quart is —— —— of a peck.
7. Three quarts are —— —— of a peck.
8. Five quarts are —— —— of a peck.
9. Seven quarts are —— —— of a peck.
10. One peck is —— —— of a bushel.
11. Two pecks are —— —— of a bushel.
12. Three pecks are —— —— of a bushel.
13. Five pecks are ——————.
14. Two bushels are —— pecks.
15. One bushel and three pecks are —— pecks.
16. One peck and three quarts are —— quarts.
17. Fourteen quarts are —— peck and ——.
18. Fourteen pecks are —— bushels and ——.
19. Thirteen quarts are —— peck and ——.
20. Thirteen pecks are —— bushels and ——.
21. At 20 cents a peck, one bushel of potatoes costs —— cents.
22. At 10 cents a quart, one peck of beans costs —— cents.
23. At 40 cents a bushel, one peck of apples costs —— cents.
24. At 5 cents a quart, one gallon of kerosene costs —— cents.

* Use the measures (quart, peck, and half-bushel), and take care that the pupil clearly understands and memorizes these facts.

1. Two quarts and one pint are —— pints.
2. Two gallons and one quart are — quarts.
3. Two feet and one inch are —— inches.
4. Two yards and one foot are —— feet.
5. Two dimes and one cent are —— cents.
6. Two pecks and one quart are —— quarts.
7. Two bushels and one peck are —— pecks.
8. Two nickels and one cent are —— cents.
9. Two halves and one fourth are —— fourths.
10. Two halves and one sixth are —— sixths.
11. Two halves and one eighth are —— eighths.
12. Two fourths and one eighth are —— eighths.

13. How many of the class can read the first 12 statements on this page, filling each blank with the right number, in one minute or less?

14. Can you read the first eight statements on page 48 in thirty seconds or less? Try it.

(1) Read, and give quotients.* (2) Copy and divide. (3) Tell number stories.

2)120	2)122	2)124	2)140	2)144
3)120	3)123	3)126	3)129	4)128
2)50	2)250	2)450	2)650	2)850

* See foot-notes, pages 15 and 21. See also examples on pages 36 and 37. Review these pages if necessary. Observe the double nature of these problems. Require two number stories for each problem; thus (a), I paid 120 cents for two yards of wide ribbon; one yard cost 60 cents; and (b), I paid 120 cents for some very narrow ribbon that cost only 2 cents a yard; there were 60 yards. Or (a), I divided 120 walnuts equally between 2 girls; each girl received 60 walnuts; and (b), I divided 120 walnuts among some girls, giving to each girl 2 walnuts; there were 60 girls.

Review.

1. Nine slates and five slates are —— slates.

2. Seven dollars and six dollars are —— dollars.

3. My book is —— inches long.

4. If I should draw an oblong 2 inches wide and 7 inches long, and then divide it into 1-inch squares, there would be —— rows of squares, and in each row there would be —— squares. An oblong 2 inches by 7 inches contains —— square inches.

5. Two times 7 square inches are —— square inches.

6. Seven times 2 square inches are —— square inches.

7. Henry is 5 feet and 1 inch tall; his sister is 4 feet 6 inches tall; Henry is —— inches taller than his sister.

8. Jane had a piece of red ribbon 14 inches long; she cut from it pieces 4 inches long; when she had cut off 3 pieces, she had —— —— left.

9. In 14 there are —— fours and —— remainder.

10. In 14 there are —— sixes and —— remainder.

11. In 14 there are —— threes and —— remainder.

12. In 14 there are —— fives and —— remainder.

13. Byron buys apples at 1 half a cent each and sells them for 1 cent each; on one apple he gains ——; on 14 apples he gains —— cents.

14. Harry pays 12½ cents a dozen for eggs; he sells them at 15 cents a dozen; on one dozen he gains ——; on two dozen he gains —— cents.

15. Fourteen days are —— weeks. To-day is ——. Two weeks from to-day will be ——. Fifteen days from to-day will be ——. Thirteen days from to-day will be ——. Two days from to-day will be——.

Review.

1. Howard has two pieces of board; one piece is 1 and 1 eighth inches thick; the other is 1 and 1 fourth inches thick; together they are — - - and ——— ——— inches thick.

2. Draw an oblong 2 and 3 eighths inches wide; make it twice as long as it is wide. It will be ——— and ——— ——— inches long.

3. Two times 2 and 3 eighths are ————.

4. Draw a line 1 and 1 half inches long; divide it into parts each 1 eighth of an inch long; there are ——— parts.

5. Two eighths of an inch are contained in 1 and 1 half inches (12 eighths) ——— times.

6. One half of 4 and 1 fourth is ———.

(1) Read, and give sums. (2) Copy and add. (3) Tell number stories.

$36\frac{1}{2}$	$32\frac{1}{2}$	$33\frac{1}{4}$	$35\frac{1}{4}$	$31\frac{1}{4}$
$2\frac{1}{2}$	$5\frac{1}{4}$	$4\frac{1}{2}$	3	$4\frac{1}{4}$

(1) Read, and give differences. (2) Copy and subtract. (3) Tell number stories.

$34\frac{1}{2}$	$38\frac{1}{2}$	$37\frac{1}{4}$	36	39
$2\frac{1}{8}$	$5\frac{1}{4}$	$4\frac{1}{8}$	$2\frac{1}{2}$	$4\frac{1}{4}$

(1) Read, and give products. (2) Copy and multiply. (3) Tell number stories.

$23\frac{1}{3}$	$21\frac{1}{2}$	$21\frac{1}{4}$	$24\frac{1}{2}$	$22\frac{1}{4}$
2	2	3	2	4

(1) Read, and give quotients * (2) Copy and divide. (3) Tell number stories.

$2)\overline{8\frac{1}{2}}$	$2)\overline{6\frac{1}{4}}$	$3)\overline{6\frac{1}{2}}$	$2)\overline{4\frac{6}{8}}$	$3)\overline{9\frac{3}{8}}$

* Require pupils to read these problems in one way only; thus, $\frac{1}{2}$ of $8\frac{1}{2}$ is $4\frac{1}{2}$; $\frac{1}{2}$ of $6\frac{1}{4}$ is $3\frac{1}{4}$, etc.

Four number facts to be memorized.

9	8	
6	7	3 fives are 15.
15	15	5 threes are 15.

1. Nine and 6 are ——. 8 and 6 are ——.
2. Nine and 5 are ——. 8 and 7 are ——.

3. Fifteen less 9 are ——. 15 less 7 are ——.
4. Fifteen less 8 are ——. 15 less 6 are ——.
5. Fifteen less 3 are ——. 15 less 10 are ——.
6. Fifteen less 4 are ——. 15 less 12 are ——.

7. 15 is —— 5's. 15 is —— 3's.
8. 15 is 2 7's and ——. 15 is 2 6's and ——.
9. 15 is 7 2's and ——. 15 is 3 4's and ——.

10. Fifteen is one dozen and ——.
11. Fifteen inches are —— foot and —— inches.
12. Fifteen cents are —— dime and —— cents.
13. Fifteen days are —— weeks and —— day.
14. Fifteen pints are —— quarts and —— pint.
15. Fifteen quarts are —— pints.
16. Fifteen feet are —— yards.
17. Fifteen quarts are —— gallons and —— quarts.
18. Fifteen quarts are —— peck and —— quarts.
19. Fifteen pecks are —— bushels and —— pecks.
20. Fifteen halves are —— wholes and —— half.
21. Fifteen thirds are —— wholes.
22. Fifteen fourths are —— wholes and —— fourths.
23. Fifteen fifths are —— wholes.
24. Fifteen sixths are —— wholes and —— sixths.
25. Fifteen eighths are —— whole and —— eighths.
26. Fifteen sevenths are —— wholes and —— 7th.
27. Fifteen tenths are —— whole and —— 10ths.

1. Nine bushels of potatoes and 6 bushels of potatoes are ——— bushels of potatoes.

2. Eight rows of trees and 6 rows of trees are ——— rows of trees.

3. Fifteen pounds of butter less 7 pounds of butter are ——— pounds of butter.

4. Fifteen quarts of walnuts less 9 quarts of walnuts are ——— quarts of walnuts.

5. Three times 5 lemons are ——— lemons.

6. Five times 3 oranges are ——— oranges.

7. Five quarts are contained in 1 peck and 7 quarts (15 quarts) ——— times.

8. Three quarts are contained in 1 peck and 4 quarts ——— times.

9. Six bushels are contained in 15 bushels ——— times with a remainder of ——— bushels.

10. Seven quarts are contained in 15 quarts ——— times with a remainder of ——— quart.

11. Four pecks are contained in 15 pecks ——— times with a remainder of ——— pecks.

12. One half of 15 inches is ——— inches.

13. Fifteen inches are one half of ——— inches.

14. One third of 15 inches is ——— inches.

15. Two thirds of 15 inches are ——— inches.

16. One fifth of 15 feet is ——— feet.

17. Two fifths of 15 feet are ——— feet.

18. Three fifths of 15 feet are ——— feet.

19. Alice had 15 apples; she gave two fifths of them to her sister; she gave her sister ——— apples and had ——— apples left.

20. Ten balls are two thirds of ——— balls.

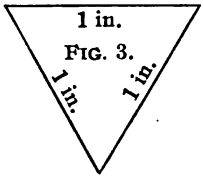


FIG. 3.

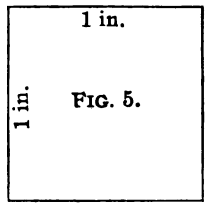


FIG. 5.

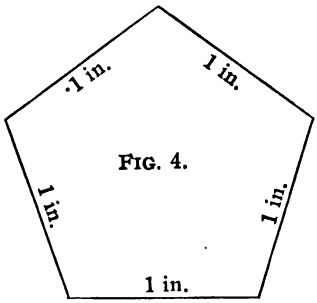


FIG. 4.

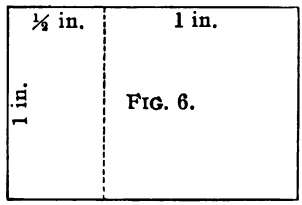


FIG. 6.

1. A triangle has —— sides.
2. An oblong has —— sides.
3. A pentagon has —— sides.
4. A square has —— sides.

5. Figure 3 has —— sides. It is a —— .
6. Figure 4 has —— sides. It is a —— .
7. Figure 5 has —— sides. It is a —— .
8. Figure 6 has —— sides. It is an —— .

9. The perimeter of figure 3 is —— inches.
10. The perimeter of figure 4 is —— inches.
11. The perimeter of figure 5 is —— inches.
12. The perimeter of figure 6 is —— inches.
13. Take your pencil and find the sum of the perimeters of all the figures given on this page.

*Teach the meaning and use of the words *triangle* and *pentagon*.

1. James lives 8 miles north of the Court House; Joseph lives 7 miles south of the Court House; from James's home to Joseph's home it is —— miles.

2. * At night the out-door temperature was 9 degrees above zero; the next morning it was 6 degrees below zero; the temperature had fallen —— degrees. What was the season of the year?

3. In the morning the out-door temperature was 80 degrees above zero; at noon it was 90 degrees above zero; the temperature had risen —— degrees. What was the season of the year?

4. 3 cents)12 cents. This means, find how many times 3 cents are contained in 12 cents. Three cents are contained in 12 cents — times.

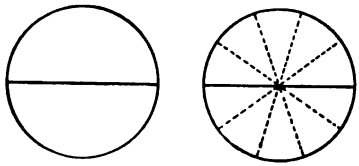
5. 3)12 cents. This means, find one third of 12 cents. One third of 12 cents is — cents.

(1) Read, and give sums.† (2) Copy and add. (3) Tell number stories.

106	109	108	108	107
107	106	106	105	108
—	—	—	—	—
126	129	128	128	127
7	6	6	5	8
—	—	—	—	—
127	126	128	125	129
7	9	7	8	5
—	—	—	—	—

* The thermometer should be examined and observed by the pupil before such work as this is attempted. See foot-note, page 19.

† In adding 126 and 7 without a pencil lead the pupil to divide the 7 into two parts one of which when added to 126 will make 130. Lead him to adopt this method in all similar problems. In adding 136 and 9, he will think the 9 as made up of 4 and 5; he will think,—"126 and 4=130; 130 and 5=135." In adding the same with the aid of a pencil, he may think,—"9 and 6 are 15—1 ten and 5; write the 5 and 'carry' the 1 ten," etc. Do not ask him to "explain" very much at this stage of the work. Let him think and do, and express, orally or in writing, the results of his thinking and doing.



1. One whole is —— tenths.
2. One half is —— tenths.
3. One and one half are —— tenths.
4. One half and one tenth are —— tenths.
5. One half and three tenths are —— tenths.
6. One half and two tenths are —— tenths.
7. One half and four tenths are —— tenths.

8. One half less one tenth are —— tenths.
9. One half less four tenths is —— tenth.
10. One whole less three tenths are —— tenths.
11. One half less two tenths are —— tenths.

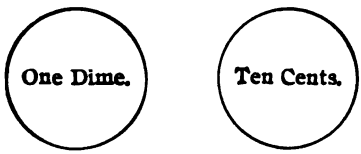
12. Two times three tenths are —— tenths.
13. Four times two tenths are —— tenths.
14. Three times four tenths are ———— .
15. Five times three tenths are ———— .

16. Two tenths are contained in six tenths —— times.
17. Two tenths are contained in one whole —— times.
18. One tenth is contained in one half —— times.

19. One fifth of one half is ———— .
20. Two fifths of one half are ———— .
21. One fifth of one whole is ———— tenths.
22. Two fifths of one whole are ———— tenths.

23. One tenth is contained in two wholes —— times.
24. One half is contained in two wholes —— times.

Review pages 45 and 55. See foot-note, page 55.



1. One dime is one tenth of a dollar.

2. One half-dollar is —— tenths of a dollar.

3. One half of a dollar and one tenth of a dollar are —— tenths of a dollar.

4. One half of a dollar and three tenths of a dollar are —— tenths of a dollar.

5. One half of a dollar less one tenth of a dollar are —— tenths of a dollar.

6. One half of a dollar less three tenths of a dollar are —— tenths of a dollar.

7. Three times three tenths of a dollar are —— tenths of a dollar.

8. Four times three tenths of a dollar are —— tenths dollars, or one and —— tenths dollars.

9. Two tenths of a dollar are contained in one dollar —— times.

10. One tenth of a dollar is contained in one half of a dollar —— times.

11. One fifth of one half of a dollar is —— —— of a dollar.

12. Three fifths of one half of a dollar are —— —— of a dollar.

13. One half of a dollar and one quarter of a dollar and one tenth of a dollar are —— cents.

Three number facts to be memorized.

2 fifties are 100. 4 twenty-fives are 100.

5 twenties are 100.

	(a)*	(b)	(c)
1. Can you add column (a) in fifteen seconds, beginning at the top?	2	2	2
2. Can you add column (a) in fifteen seconds, beginning at the bottom?	2	2	2
3. Can you add column (b) in fifteen seconds?	2	2	1
4. Can you add column (c) in fifteen seconds?	2	2	2
5. Ten twos are ——.	2	2	2
6. Fifteen twos are ——.	2	2	1
7. Twenty twos are ——.	2	2	1
8. Twenty-five 2's are ——.	2	1	2
9. Thirty twos are ——.	2	2	1
10. Forty twos are ——.	2	2	2
11. Fifty twos are ——.	2	2	2
12. Two fifties are ——.	2	2	2
13. Four 25's are ——.	2	2	1
14. One fourth of 100 is ——.	2	2	2
15. One fifth of 100 is ——.	2	2	1
16. 75 is three fourths of ——.	2	2	2
17. 40 is two fifths of ——.	2	2	2
18. Harry had one dollar (100 cents); he spent three fourths of his money; he then had —— cents.	2	1	2
	1	2	2

* Require pupils to add numbers represented by figures in a column, without naming each number; thus, in adding column (a), the pupil will say, *Two, four, six, eight,* etc. Put columns similar to these upon the blackboard, and continue the drill until the pupils can add a column made up of 2's and 1's almost as readily as they can add a column of 2's.

1. There were 100 trees in a park; one fifth of them were elms; one fifth were maples, and the remainder were oaks. There were —— elms, —— maples, and —— oaks.

2. There were 100 people at a banquet; one fourth of them were men; one fourth were women, and the remainder were children. There were —— men, —— women, and —— children.

3. Sarah bought a doll; the price was 75 cents; she gave the salesman one dollar; she should receive in change —— cents.

4. Howard bought seven boxes of berries at 10 cents a box; he gave the salesman one dollar; he should receive in change —— cents.

5. Twenty two-cent stamps cost —— cents.

6. For fifty cents I can buy —— two-cent stamps.

(1) Read, and give differences.* (2) Copy and subtract. (3) Tell number stories.

131	132	133	134	135
6	4	5	6	6
141	142	143	144	145
5	6	4	8	6
151	142	143	144	145
4	5	6	7	8
161	162	163	164	165
103	105	107	106	108

* In subtracting 5 from 133 without a pencil, lead the pupil to divide the 5 into two parts, one of which, when subtracted from 133, will leave 130. Lead him to adopt this method in all similar problems. In subtracting 7 from 144, he will think 7 as made up of 4 and 3; in subtracting 6 from 145, he will think 6 as made up of 5 and 1, etc. In doing the same with the aid of the pencil, he should take one ten and combine it with the units of the minuend in the usual manner. See last part of note on page 64.

Review.

1. Nine pens and six pens are —— pens.

2. Eight desks and seven desks are —— desks.

3. My desk is —— inches wide.

4. If I should draw an oblong 3 inches wide and 5 inches long and then divide it into 1 inch squares, there would be —— rows of squares, and in each row there would be —— squares. An oblong 3 inches by 5 inches contains —— square inches.

5. Three times 5 square inches are —— square inches.

6. Five times 3 square inches are —— square inches.

7. Robert's father is 6 feet 2 inches tall; Robert is 5 feet 1 inch tall. How much taller is Robert's father than Robert?

8. Alice had a piece of green ribbon 15 inches long; she cut from it pieces four inches long; when she had cut off 3 pieces she had —— inches left.

9. In 15 there are —— fours and —— remainder.

10. In 15 there are —— sixes and —— remainder.

11. In 15 there are —— sevens and —— remainder.

12. In 15 there are —— twos and —— remainder.

13. Byron buys peanuts at 3 cents a bag; he sells them at 5 cents a bag; on one bag he gains —— cents; on 50 bags he gains ————.

14. In 1 and 1 fourth feet there are —— inches.

15. If a melon costs 15 cents, 1 fifth of a melon costs —— cents.

16. One ten and 5 are ——. 2 tens and 5 are ——.

17. If I drink 1 pint of milk each day, in 2 weeks I shall drink —— quarts of milk.

18. Fifteen pints are ———— quarts.

Number facts to be memorized.

There are two ways to write tenths in figures.
3 tenths may be written $\frac{3}{10}$ or .3.
1 and 2 tenths may be written $1\frac{2}{10}$ or 1.2.
12 tenths may be written $\frac{12}{10}$ or 1.2.

When the period is used in writing numbers, it is called a *point*, or a *decimal point.*

1. Write in figures, using the decimal point; 4 tenths, 14 tenths, 9 tenths, 11 tenths, 15 tenths, 25 tenths, 6 tenths, 1 and 4 tenths, 2 and 3 tenths.

2. Read the following in two ways: 1.6,* 2.7, 4.5.

(1) Read, and give sums. (2) Copy and add. (3) Tell number stories.

$3\frac{2}{10}$	3.2	$5\frac{6}{10}$	5.6	4.3
$\frac{3}{10}$	.3	$3\frac{3}{10}$	3.3	2.4

(1) Read, and give differences. (2) Copy and subtract. (3) Tell number stories.

$9\frac{5}{10}$	9.5	$7\frac{6}{10}$	7.5	8.3
$3\frac{4}{10}$	3.4	$4\frac{1}{10}$	4.1	2.2

(1) Read, and give products. (2) Copy and multiply. (3) Tell number stories.

$4\frac{3}{10}$	4.3	$3\frac{2}{10}$	3.2	2.2
2	2	3	3	4

(1) Read, and give quotients. (2) Copy and divide.† (3) Tell number stories.

$2)6\frac{4}{10}$	2)6.4	$2)8\frac{6}{10}$	2)8.6	3)9.6

* It must be made very clear to the pupil that there is no difference in value between 1 and 6 tenths and 16 tenths. The expression 1.6 must suggest to him both 1 and 6 tenths and 16 tenths. To this end he must be required to read such expressions in the two ways suggested, many times.

† Require pupils to read these prob'ems in one way only; thus, $\frac{1}{2}$ of $6\frac{4}{10}$ is $3\frac{2}{10}$; $\frac{1}{2}$ of $8\frac{6}{10}$ is $4\frac{3}{10}$, etc.

Four number facts to be memorized.

9	8	
7	8	8 twos are 16.
16	16	4 fours are 16.

1. Nine and 7 are ——. 8 and 7 are ——.
2. Eight and 8 are ——. 9 and 6 are ——.

3. Sixteen less 7 are ——. 16 less 9 are ——.
4. Sixteen less 8 are ——. 16 less 10 are ——.
5. Sixteen less 5 are ——. 16 less 12 are ——.
6. Sixteen less 4 are ——. 16 less 11 are ——.

7. 16 is —— 8's. 16 is —— 4's.
8. 16 is 2 7's and ——. 16 is —— 2's.
9. 16 is 3 5's and ——. 16 is 2 6's and ——.

10. Sixteen is one dozen and ——.
11. Sixteen inches are —— foot and —— inches.
12. Sixteen cents are —— dime and —— cents.
13. Sixteen days are —— weeks and —— days.
14. Sixteen pints are —— quarts.
15. Sixteen quarts are —— pints.
16. Sixteen feet are —— yards and —— foot.
17. Sixteen quarts are —— gallons.
18. Sixteen quarts are —— pecks.
19. Sixteen pecks are —— bushels.
20. Sixteen tenths are —— and —— tenths.
21. Sixteen eighths are —— wholes.
22. Sixteen fifths are —— and —— fifth.
23. Sixteen dimes are —— dollar and —— dimes.
24. Sixteen fourths are —— wholes.
25. Sixteen thirds are —— and —— third.

1. Nine spans of horses and 7 spans of horses are —— spans of horses.

2. Eight loads of coal and 7 loads of coal are —— loads of coal.

3. Sixteen gallons of oil less 9 gallons of oil are —— gallons of oil.

4. Sixteen pounds of cheese less 8 pounds of cheese are —— pounds of cheese.

5. Two times 8 days are —— days.

6. Four times 4 bushels are —— bushels.

7. Two inches are contained in one foot and 4 inches (16 inches) —— times.

8. Four inches are contained in 1 foot and 4 inches —— times.

9. Five inches are contained in 16 inches —— times with a remainder of —— inch.

10. Six inches are contained in 16 inches —— times with a remainder of —— inches.

11. Seven inches are contained in 16 inches —— times with a remainder of —— inches.

12. One half of 16 feet is —— feet.

13. One fourth of 16 feet is —— feet.

14. Three fourths of 16 feet are —— feet.

15. One third of 16 feet is —— and —— —— feet.

16. Two thirds of 16 feet are —— and —— —— feet.

17. One eighth of 16 feet is —— feet.

18. Three eighths of 16 feet are —— feet.

19. $\frac{3}{4}$ of 12 are ——. 12 is $\frac{3}{4}$ of ——.*

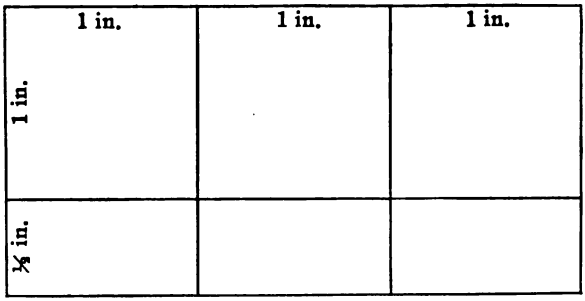
20. $\frac{1}{3}$ of 12 is ——. 12 is $\frac{1}{3}$ of ——.

21. $\frac{1}{8}$ of 16 is ——. 16 is $\frac{1}{8}$ of ——.

22. $\frac{1}{2}$ of 8 is ——. 8 is $\frac{1}{2}$ of ——.

* Review, page 17.

FIG. 7.



1. By the area * of a figure we mean the amount of its surface. The area of Fig. 7 is —— square inches.

2. The perimeter of Fig. 7 is —— inches.

3. The perimeter of a 2-inch square is —— inches. The area of a 2-inch square is —— square inches.

4. The perimeter of a 3-inch square is —— inches. The area of a 3-inch square is —— square inches.

5. The perimeter of a 4-inch square is —— inches. The area of a 4-inch square is —— square inches.

6. The perimeter of an oblong 2 inches by 3 inches is —— inches. The area of an oblong 2 inches by 3 inches is —— square inches.

7. The sum of two numbers is 16; one of the numbers is 9; the other number is ——.

8. The difference of two numbers is 5; the less number is 11; the greater number is ————.

* Teach orally the meaning and use of the word *area* before the pupil is asked to read this page. Tell the pupil that the expression *1 square inch* means a 1-inch square *or its equivalent.*

1. Hattie lives 7 miles south of Waukegan; Elsie lives 9 miles south of Hattie's home; from Waukegan to Elsie's home it is —— miles.

2. When the top of the mercury column in a thermometer is at 32 degrees above zero, water will begin to freeze. Thirty-two degrees above zero is called "the freezing point." When the top of the mercury column is at 40 degrees above zero, it is —— degrees above the freezing point. When the top of the mercury column is at 26 degrees above zero, it is —— degrees below the freezing point.*

3. 4 inches)12 inches. This means find how many times 4 in. are contained in 12 inches.

Four inches are contained in 12 inches —— times.

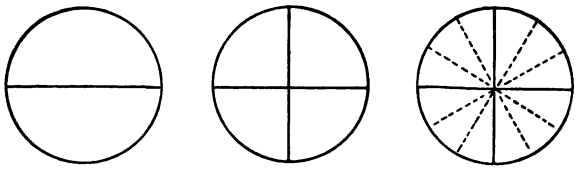
4. 4)12 inches. This means find one fourth of 12 inches. One fourth of 12 inches is —— inches.

(1) Read and give products.† (2) Copy and multiply. (3) Tell number stories.

32	42	52	62	72
2	2	2	2	2
82	32	42	52	32
2	3	3	3	4
42	32	135	145	125
4	5	2	2	2
150	250	350	450	151
2	2	2	2	2

* See foot-notes, pages 19 and 64.

† Help the pupil to think in the order suggested by the following: Teacher. 135 multiplied by 2? Pupil. 200, 260, 270.



1. One whole is —— twelfths.
2. One half is —— twelfths.
3. One fourth is —— twelfths.
4. Three fourths are —— twelfths.
5. One half and 1 twelfth are —— twelfths.
6. One half and 5 twelfths are —— twelfths.
7. One fourth and 1 twelfth are —— twelfths.
8. Three fourths and 1 twelfth are —— twelfths.

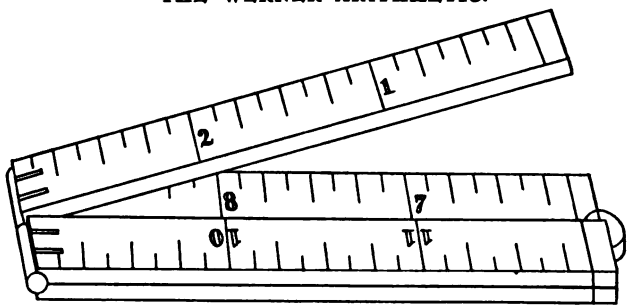
9. One half less 1 twelfth are —— twelfths.
10. One half less 5 twelfths is —— twelfth.
11. One fourth less 1 twelfth are —— twelfths.
12. Three fourths less 1 twelfth are —— twelfths.
13. Three fourths less 5 twelfths are —— twelfths.

14. Two times 5 twelfths are —— twelfths.
15. Three times 2 twelfths are ————.
16. Two times 8 twelfths are ————.

17. Two twelfths are contained in 1 half —— times.
18. Two twelfths are contained in 1 whole —— times.
19. One twelfth is contained in 1 fourth —— times.

20. One third of 1 fourth is ————.
21. Two thirds of 1 fourth are ————.

22. Five twelfths and 1 fourth are —— twelfths.
23. Five twelfths and 1 half are —— twelfths.
24. Five twelfths less 1 fourth are —— twelfths.



1. One inch is 1 twelfth of a foot.
2. One half of a foot is —— twelfths of a foot.
3. One half of a foot and 1 twelfth of a foot are —— twelfths of a foot.
4. One half of a foot and 5 twelfths of a foot are —— twelfths of a foot.
5. One half of a foot less 1 twelfth of a foot are —— twelfths of a foot.
6. One half of a foot less 5 twelfths of a foot is —— twelfth of a foot.
7. Two times 5 twelfths of a foot are —— twelfths of a foot.
8. Three times 5 twelfths of a foot are —— twelfths feet, or 1 and —— twelfths feet.
9. Two twelfths of a foot are contained in 1 half of a foot —— times.
10. Three twelfths of a foot are contained in 1 foot —— times.
11. One third of one fourth of a foot is —— twelfth of a foot.
12. One fourth of a foot and 1 twelfth of a foot are —— twelfths of a foot.
13. One fourth of a foot less 1 twelfth of a foot are —— twelfths of a foot.
14. One third of a foot and 1 twelfth of a foot are —— twelfths of a foot.

Four number facts to be memorized.

12 threes are 36. 11 threes are 33.
3 twelves are 36. 3 elevens are 33.

1. Can you add each of these columns in fifteen seconds, beginning at the top?

2. Can you add each of these columns in fifteen seconds, beginning at the bottom?

3. Ten threes are ——.
4. Fifteen threes are ——.
5. Twenty threes are ——.
6. Twenty-five threes are ——.
7. Thirty threes are ——.
8. Forty threes are ——.

9. 28 and 3 = 58 and 3 =
10. 48 and 3 = 38 and 3 =
11. 78 and 3 = 98 and 3 =

12. 29 and 3 = 59 and 3 =
13. 49 and 3 = 39 and 3 =
14. 79 and 3 = 99 and 3 =

15. 37 and 3 = 57 and 3 =
16. 47 and 3 = 67 and 3 =
17. 77 and 3 = 97 and 3 =

18. Three 10's = 3 20's =
10. Three 30's = 3 40's =

(a)	(b)	(c)	(d)
3	2	3	3
3	3	3	3
3	3	3	2
3	3	3	3
3	3	3	1
3	3	3	3
3	3	3	2
3	3	2	3
3	3	3	1
3	3	3	3
3	3	3	2
3	3	3	3
3	3	3	2
3	3	3	1
3	3	3	3
3	3	3	3
3	3	3	1
3	3	3	2
3	3	1	3
3	3	3	3
3	3	3	2
3	3	3	2
3	3	3	1
3	3	3	3
3	3	3	3
1	3	3	2

It is not expected that pupils will be able to do this work in the time suggested before passing to the next page; but if a few minutes' daily drill be given to the columns on page 67, pupils will soon be able to add either of those columns in fifteen seconds. Continue the drill, using the figures given on pages 77, 87, 97, etc., and by the time the book is completed most pupils will be able to add any one of the columns in the time specified. For daily drill it will be found most convenient to have these columns written upon the blackboard. It will be noticed that the columns on the several pages mentioned are so arranged as to give a systematic drill upon all possible combinations in addition. See foot-note, page 67.

1. There were 90 trees in an orchard; one third of them were apple trees; one third of them were pear trees, and the remainder were peach trees. There were —— apple trees, —— pear trees, and —— peach trees.

2. Three fourths of the trees in a park were maples; the remainder were oaks; there were 75 maples. There were —— trees in the park. There were —— oaks in the park.

3. Seventy-five is three fourths of ——.

4. Thirty is three fourths of ——.

5. William bought 30 oranges at 3 cents each; he gave the salesman 1 dollar; he should receive in change —— cents.

6. Herbert bought 2 packages of paper at 20 cents each; he gave the salesman half a dollar; he should receive in change —— cents.

7. Twenty 3-cent stamps cost —— cents.

8. For 90 cents I can buy —— 3-cent stamps.

(1) Read, and give quotients.* (2) Copy and divide. (3) Tell number stories.

2)30	2)230	2)430	2)630	2)830
2)32	2)232	2)432	2)632	2)832
2)26	2)236	2)436	2)636	2)836

* Observe the double nature of these problems. (a) One half of 30 is 15. (b) Two is contained in 30 fifteen times. See foot-note, page 58.

One square yard contains 9 square feet. *

1. Think of a 1-foot square. Think of a 3-foot square. Think of a 3-foot square divided into 1-foot squares. A 3-foot square contains —— square feet.

2. A 3-foot square is sometimes called a square yard. A square yard contains —— square feet.

3. One third of a square yard is —— square feet.

4. Two thirds of a square yard are —— square feet.

5. If I should draw an oblong 3 feet wide and 4 feet long and divide it into 1-foot squares there would be —— rows of squares, and in each row there would be —— squares. An oblong 3 feet by 4 feet contains —— square feet.

6. Three times 4 square feet are —— square feet.

7. Four times 3 square feet are —— square feet.

8. An oblong 3 feet by 4 feet contains 1 and —— —— square yards.

9. A 4-foot square contains —— square feet.

10. A 4-foot square contains 1 square yard and —— square feet.

11. An oblong 3 feet wide and 5 feet long contains —— square feet.

12. An oblong 3 feet by 5 feet contains 1 square yard and —— square feet.

13. One half of a square yard contains —— square feet.

14. Six square feet are —— —— of a square yard.

15. One square foot is contained in 1 square yard —— times.

16. Three square feet are contained in 1 square yard —— times.

* Prepare for this page by such oral work and blackboard diagrams as will make the pupil thoroughly familiar with the terms here employed. This oral work should be repeated many times before the pupil is asked to read the page.

Review page 70.

1. Write in figures using the decimal point; thirty-four tenths, two and seven tenths, forty-five tenths, four and two tenths.

2. Read the following in two ways: 1.9, 3.8, 2.4, 5.1, 7.2, 3.4, 2.9.

3. Write in figures; three fourths, one fifth, one tenth, three eighths, two thirds, one half.

4. Draw an oblong 3 and 1 fourth inches wide; make it twice as long as it is wide; it is ——— and ——— ——— inches long.

(1) Read, and give sums. (2) Copy and add. (3) Tell number stories.*

$24\frac{1}{2}$	$23\frac{1}{10}$	23.1	$14\frac{1}{2}$	14.5
$4\frac{1}{4}$	$3\frac{3}{10}$	3.3	$2\frac{1}{10}$	2.1

(1) Read, and give differences. (2) Copy and subtract. (3) Tell number stories.*

$26\frac{1}{2}$	$25\frac{4}{10}$	25.4	$28\frac{1}{2}$	28.5
$2\frac{1}{4}$	$2\frac{1}{10}$	2.1	$4\frac{1}{10}$	4.1

(1) Read, and give products. (2) Copy and multiply. (3) Tell number stories.*

$6\frac{1}{4}$	$24\frac{1}{10}$	24.1	$24\frac{1}{3}$	$24\frac{3}{8}$
2	2	2	2	2

(1) Read, and give quotients.† (2) Copy and divide. (3) Tell number stories.*

$2)24\frac{6}{10}$	2)24.6	$2)46\frac{1}{2}$	3)36.3	$3)36\frac{3}{10}$

* It is not expected that pupils will tell a number story for every problem; but they should at least give one number story for each class of problems found on any page.

† Require pupils to read these problems in one way only; thus, $\frac{1}{2}$ of 24.6 is 12.3.

Five number facts to be memorized.

9	9	
8	9	3 sixes are 18.
17	18	6 threes are 18.

1. Nine and 8 are ——. 9 and 9 are ——.
2. Nine and 7 are ——. 9 and 6 are ——.

3. Seventeen less 8 are ——. 17 less 12 are ——.
4. Seventeen less 7 are ——. 17 less 11 are ——.
5. Eighteen less 9 are ——. 18 less 12 are ——.
6. Eighteen less 8 are ——. 18 less 15 are ——.

7. 18 is —— 9's. 18 is —— 6's.
8. 18 is 4 4's and ——. 18 is 3 5's and ——.
9. 18 is 2 7's and ——. 18 is 2 8's and ——.
10. 17 is 8 2's and ——. 17 is 5 3's and ——.
11. 17 is 4 4's and ——. 17 is 3 5's and ——.
12. 17 is 2 6's and ——. 17 is 2 7's and ——.
13. 17 is 2 8's and ——. 17 is 11 and ——.

14. Seventeen inches are —— foot and —— inches.
15. Seventeen dimes are —— dollar and —— dimes.
16. Seventeen days are —— weeks and —— days.
17. Seventeen pints are —— quarts and —— pint.
18. Seventeen quarts are —— pecks and —— quart.
19. Seventeen quarts are —— gallons and —— quart.
20. Eighteen tenths are —— and —— tenths.
21. Eighteen fifths are —— and —— fifths.
22. Eighteen fourths are —— and ——.
23. Eighteen feet are —— yards.
24. Eighteen cents are —— dime and —— cents.
25. Seventeen feet are —— yards and —— feet.
26. Seventeen tenths are —— and —— tenths.
27. Eighteen days are —— weeks and —— days.

For Drill in Adding.*

9	9	8	7
4	6	8	6
9	7	9	8
9	7	7	6
8	8	9	9
5	7	5	8

Review and drill until pupils can give the sums in any order in 12 seconds. It provides an excellent exercise to put the figures found in this table upon 12 cards, 2 figures on each card; then allow the pupils to handle the cards and name the sums as rapidly as possible.

Suspend a pendulum 39 inches long, and see how many pupils can recite these sums while it vibrates 12 times.

For Drill in Multiplying.

This is a review of the 23 facts of multiplication that have already been presented.

2 times 2 are ——. 2 times 5 are ——.
4 times 2 are ——. 3 times 6 are ——.
6 times 2 are ——. 2 times 7 are ——.
3 times 2 are ——. 3 times 5 are ——.
5 times 2 are ——. 2 times 9 are ——.
8 times 2 are ——. 2 times 8 are ——.
7 times 2 are ——. 2 times 6 are ——.
9 times 2 are ——. 4 times 3 are ——.
3 times 3 are ——. 5 times 3 are ——.
2 times 4 are ——. 6 times 3 are ——.
2 times 3 are ——. 3 times 4 are ——.
4 times 4 are ——.

TO THE PUPIL.—Can you read the above, filling all the blanks correctly, in 30 seconds?

* It is surprising how many pupils pass into and even through the Fifth grade without an absolute mastery of all of the 12 number facts called for in this table. These, together with the 33 facts called for in the drill table on page 18, make up what are known as the 45 primary facts of addition. Much time will be saved for both pupils and teachers if the complete mastery of these is insisted upon at this point. Give daily drill upon them until every pupil can give these 45 sums in any order in 45 seconds or less. See foot-note, page 18.

1. Henry drew an oblong upon his slate. It contained 10 square inches. It was 5 inches long. It was —— inches wide.

2. An oblong 3 inches wide and 5 inches long contains —— square inches.

3. A square that contains 4 square inches is a —— inch square.

4. A square that contains 9 square inches is a —— inch square.

5. Mary drew a square upon her slate; the area of the square was 16 square inches. It was a —— inch square.

6. I am thinking of an oblong whose area is 12 square inches. It is 6 inches long. It is —— inches wide.

7. I am thinking of an oblong whose area is 15 square inches. It is 5 inches long. It is —— inches wide.

8. The sum of 8 cents and 2 cents is —— cents.
9. The difference of 8 cents and 2 cents is —— cents.
10. *There can be no product of 8 cents and 2 cents.*
11. The product of 8 cents and 2 is —— cents.
12. The quotient of 8¢ divided by 2¢ is ——.*
13. The quotient of 8¢ divided by 2 is —— cents.†

14. The quotient of 15¢ divided by 3¢ is ——.
15. The quotient of 15¢ divided by 3 is —— cents.

16. The quotient of 16¢ divided by 4¢ is——.
17. The quotient of 16¢ divided by 4 is —— cents.

18. The quotient of 15¢ divided by 5¢ is ——.
19. The quotient of 15¢ divided by 5 is —— cents.

* This means that 2¢ are contained in 8¢ four times.

† This means that ¼ of 8¢ is 4¢.

1. Highland Park is 11 miles north of Evanston; Waukegan is $12\frac{1}{2}$ miles north of Highland Park; from Evanston to Waukegan it is ——— miles.

2. In the evening the outdoor temperature was 8 degrees above the freezing point;* the next morning it was 9 degrees below the freezing point; during the night it had fallen ——— degrees.

3. When the temperature is 2 degrees below the freezing point it is ——— degrees above zero.*

4. When the temperature is 28 degrees above zero, it is ——— degrees below the freezing point.

5. 5 quarts)15 quarts. This means find how many times 5 quarts are contained in 15 quarts.
5 quarts are contained in 15 quarts ——— times.

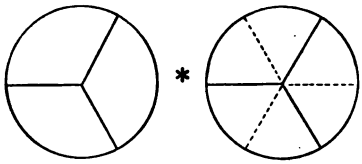
6. 5)15 quarts. This means find one fifth of 15 quarts.
One fifth of 15 quarts is ——— quarts.

(1) Read, and give sums.† (2) Copy and add. (3) Tell number stories.

126	125	134	127	136
17	18	17	19	16
125	124	123	135	137
16	18	19	16	15
146	144	147	149	146
16	17	14	15	18

* Review page 74, problem 2, if necessary.

† In adding these numbers without a pencil, lead the pupil to think in the order suggested by the following: Teacher. 126 and 17? Pupil. 126, 136, 140, 143.



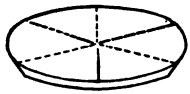
1. One whole is —— thirds.
2. One whole is —— sixths.
3. One third is —— sixths.
4. Two thirds are —— sixths.
5. One third and 1 sixth are —— sixths.
6. Two thirds and 1 sixth are —— sixths.
7. One third less 1 sixth is —— sixth.
8. Two thirds less 1 sixth are —— sixths.
9. Two times 2 sixths are —— sixths.
10. Three times 2 sixths are ————.
11. Two sixths are contained in 1 whole —— times.
12. Two sixths are contained in 2 wholes —— times.
13. One half of 1 third is —— sixth.

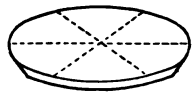
For Drill.†

14.	$\frac{1}{2}$ and $\frac{1}{4}$ =	$\frac{1}{2}$ less $\frac{1}{4}$ =	$\frac{1}{2}$ and $\frac{1}{6}$ =
15.	$\frac{1}{2}$ less $\frac{1}{6}$ =	$\frac{1}{2}$ and $\frac{1}{8}$ =	$\frac{1}{2}$ less $\frac{1}{8}$ =
16.	$\frac{1}{2}$ and $\frac{1}{10}$ =	$\frac{1}{2}$ less $\frac{1}{10}$ =	$\frac{1}{2}$ and $\frac{1}{12}$ =
17.	$\frac{1}{2}$ less $\frac{1}{12}$ =	$\frac{1}{2}$ and $\frac{2}{8}$ =	$\frac{1}{2}$ less $\frac{2}{8}$ =
18.	$\frac{1}{2}$ and $\frac{2}{10}$ =	$\frac{1}{2}$ less $\frac{2}{10}$ =	$\frac{1}{2}$ and $\frac{3}{10}$ =
19.	$\frac{1}{2}$ less $\frac{3}{10}$ =	$\frac{1}{2}$ and $\frac{4}{10}$ =	$\frac{1}{2}$ less $\frac{4}{10}$ =
20.	$\frac{1}{2}$ and $\frac{2}{12}$ =	$\frac{1}{2}$ less $\frac{2}{12}$ =	$\frac{1}{2}$ and $\frac{3}{12}$ =
21.	$\frac{1}{2}$ less $\frac{3}{12}$ =	$\frac{1}{2}$ and $\frac{5}{12}$ =	$\frac{1}{2}$ less $\frac{5}{12}$ =

* Review pages 45, 55, 65, and 75. These reviews must not be neglected. If the work is properly done, the pupil will be able to read either of the pages mentioned in 2 minutes.

† Require pupils to read these problems first by line and then by column. Continue the drill until pupils can read the 24 problems, completing each, in 2 minutes.





1. One third of a pie is 2 sixths of a pie.

2. Two thirds of a pie are 4 sixths of a pie.

3. Harry had a whole pie; he ate 1 third of it for his lunch and 1 sixth of it at dinner time; he then had ——— of a pie.

4. Sarah had 1 third of a pie; she gave 1 sixth of a pie to her little brother; she then had ——— of a pie.

5. Mrs. Smith's boarders ate $2\frac{1}{3}$ pies at dinner and $2\frac{1}{6}$ pies at supper; in all they ate ——— pies.

6. Hattie divided $2\frac{1}{3}$ pies among her playmates, giving to each $\frac{1}{3}$ of a pie; she had ——— playmates.

7. If I should divide 1 half of a pie equally among three children, each child would receive ——— of a pie.

8. If I should divide 1 half of a pie equally between two children, each child would receive ——— of a pie.

9. If I had two thirds of a pie and gave away 1 sixth of a pie, I should then have ——— of a pie.

10. $\frac{1}{3}$ of a pie)$1\frac{1}{3}$ pies. This means ———.*

11. 2)$4\frac{1}{3}$ pies. This means ———.*

*See page 64, problems 4 and 5; page 74, problems 3 and 4, and page 84, problems 5 and 6.

Four number facts to be memorized.*

12 fours are 48. 11 fours are 44.

4 twelves are 48. 4 elevens are 44.

1. Can you add each of these columns in fifteen seconds, beginning at the top?

2. Can you add each of these columns in fifteen seconds, beginning at the bottom?

3. Ten fours are ——.
4. Eleven fours are ——.
5. Twelve fours are ——.

6. 28 and 4 = 38 and 4 =
7. 48 and 4 = 58 and 4 =
8. 68 and 4 = 78 and 4 =

9. 29 and 4 = 39 and 4 =
10. 49 and 4 = 59 and 4 =
11. 69 and 4 = 79 and 4 =

12. 26 and 4 = 36 and 4 =
13. 46 and 4 = 56 and 4 =
14. 66 and 4 = 76 and 4 =

15. 27 and 4 = 37 and 4 =
16. 47 and 4 = 57 and 4 =
17. 67 and 4 = 77 and 4 =

(a)	(b)	(c)	(d)
4	2	4	3
4	4	4	4
4	4	4	2
4	4	4	1
4	4	1	1
4	4	4	3
4	4	4	4
4	4	4	2
4	4	4	3
4	4	2	1
4	4	4	4
4	4	4	2
4	4	4	2
4	4	4	1
4	4	4	3
4	4	4	4
4	4	4	2
4	4	3	4
4	4	4	3
4	4	4	1
4	4	4	2
4	4	4	4
4	4	4	2
4	4	4	3
1	3	4	4

18. Richard had 50 cents; he bought 4 tablets at 12 cents each; he then had —— cents.

* Review pages 67 and 77. Read foot-notes on the pages mentioned.

1. Seven pints are —— and —— —— quarts.
2. Two is contained in 7 —— and —— —— times.
3. Two is contained in 9 —— and —— —— times.

4. Seven feet are —— and —— —— yards.
5. Three is contained in 7 —— and —— —— times.
6. Three is contained in 10 —— and —— —— times.

7. Nine pecks are —— and —— —— bushels.
8. Four is contained in 9 —— and —— —— times.
9. Four is contained in 13 —— and —— —— times.

10. In 11 there are —— fives and —— remainder.
11. Five is contained in 11 —— and —— —— times.
12. Five is contained in 16 —— and —— —— times.

13. In 13 there are —— sixes and —— remainder.
14. Six is contained in 13 —— and —— —— times.
15. Six is contained in 19 —— and —— —— times.

(1) Read, and give differences.* (2) Copy and subtract. (3) Tell number stories.

131	132	133	134	135
16	14	15	16	16
141	142	143	144	145
15	16	14	18	16
151	142	143	144	145
14	15	16	17	18
262	262	263	264	265
113	115	117	116	118

* In solving such problems as these without a pencil, lead the pupil to think in the order suggested by the following: Teacher. 131 less 16? Pupil. 131 121, 120, 115.

1. 8 + 2, means, 8 and 2; 8 and 2 are ———.*
2. 8 – 2, means, 8 less 2; 8 less 2 are ———.*
3. 8 inches × 2, means, 2 times 8 inches; 2 times 8 inches are ——— inches.*
4. 8 inches ÷ 2 inches, means, find how many times 2 inches are contained in 8 inches; 2 inches are contained in 8 inches ——— times.*
5. 8 inches ÷ 2, means, find one half of 8 inches; one half of 8 inches is ——— inches.*
6. 12 quarts + 3 quarts, means ————.†
7. 12 quarts – 3 quarts, means ————.†
8. 12 quarts × 3, means ————.†
9. 12 quarts ÷ 3 quarts, means ————.†
10. 12 quarts ÷ 3, means ————.†

11. 4 sixths + 2 sixths, means ————. $\frac{4}{6} + \frac{2}{6} =$
12. 4 sixths – 2 sixths, means ————. $\frac{4}{6} - \frac{2}{6} =$
13. 4 sixths × 2, means ————. $\frac{4}{6} \times 2 =$
14. 4 sixths ÷ 2 sixths, means ————. $\frac{4}{6} \div \frac{2}{6} =$
15. 4 sixths ÷ 2, means ————. $\frac{4}{6} \div 2 =$

16. 6 tenths + 2 tenths, means ————. .6 + .2 =
17. 6 tenths – 2 tenths, means ————. .6 – .2 =
18. 6 tenths × 2, means ————. .6 × 2 =
19. 6 tenths ÷ 2 tenths, means ————. .6 ÷ .2 =
20. 6 tenths ÷ 2, means ————. .6 ÷ 2 =

21. 12¢ + 3¢, means ————. 12¢ – 3¢, means ————.
22. 12¢ × 3¢ = *nonsense.* 12¢ × 3, means ————.
23. 12¢ ÷ 3, means ————. 12¢ ÷ 3¢, means ————.

* Teach the pupils to read as follows: *Plus* for the addition sign, *minus* for the subtraction sign, *multiplied by* for the multiplication sign, and *divided by* for the division sign.

† Complete as indicated in the first 5 statements on this page. Take great pains to have this work mastered. Require pupils to read it aloud again and again. Put similar work upon the blackboard and require pupils to "copy and complete." No difficulty will be experienced with the 1st and 2d, the 6th and 7th, etc., but be sure that the pupil has a clear conception of *the meaning* of the last three expressions in each set of five.

1. Write in figures using the decimal point; twenty-seven tenths, three and five tenths, thirty-one tenths, five and two tenths.

2. Read the following in two ways: 1.6, 2.5, 1.7.

3. Draw an oblong 6 and 1 half inches long; make it one half as wide as it is long; it is —— and —— —— inches wide. $6\frac{1}{2}$ inches ÷ 2, means ————. $6\frac{1}{2}$ inches ÷ 2 =.

(1) Read, and give sums. (2) Copy and add. (3) Tell number stories.*

$25\frac{3}{4}$	$26\frac{7}{10}$	26.7	$23\frac{1}{2}$	24.2
$2\frac{1}{4}$	$2\frac{3}{10}$	2.3	$3\frac{1}{2}$	3.5

(1) Read, and give differences. (2) Copy and subtract. (3) Tell number stories.*

16	16	16	16	16
$2\frac{1}{2}$	$2\frac{5}{10}$	2.5	$2\frac{1}{2}$	$2\frac{3}{6}$

(1) Read, and give products. (2) Copy and multiply. (3) Tell number stories.*

$12\frac{1}{2}$	$12\frac{5}{10}$	12.5	$6\frac{1}{2}$	$6\frac{1}{2}$
2	2	2	2	3

(1) Read problems and tell their meaning.† (2) Give quotients. (3) Copy and divide. (4) Tell number stories.*

2 inches)12 inches.	2 tenths)12 tenths.	.2)1.2
2)12 inches.	2)12 tenths.	2)1.2

* See foot-note, page 80.

† 12 inches divided by 2 inches, means, find how many times 2 inches are contained in 12 inches. 12 inches divided by 2, means, find one half of 12 inches.

Six number facts to be memorized.

4 fives are 20. 5 fours are 20.
3 sevens are 21. 7 threes are 21.
3 eights are 24. 8 threes are 24.

1. Twenty pecks are —— bushels.
2. Twenty fifths are —— wholes.
3. Twenty-one days are —— weeks.
4. Twenty-one feet are —— yards.
5. Twenty-four quarts are —— pecks.
6. Twenty-four feet are —— yards.

7. 21 is —— 5's and ——. 22 is —— 4's and ——.
8. 23 is —— 10's and ——. 21 is —— 2's and ——.
9. 22 is —— 7's and ——. 23 is —— 3's and ——.
10. 24 is —— 7's and ——. 24 is —— 8's.

11. Three pecks are —— quarts. 2 pecks =
12. Three weeks are —— days. 2 weeks =
13. Eight yards are —— feet. 7 yards =
14. Five bushels are —— pecks. 4 bushels =

15. Nineteen inches are —— foot and —— inches.
16. Nineteen quarts are —— pecks and —— quarts.
17. Twenty days are —— weeks and —— days.
18. Twenty-one dimes are —— dollars and —— dime.
19. Twenty-two pecks are —— bushels and —— pecks.
20. Twenty-two feet are —— yards and —— foot.
21. Twenty-three quarts are —— gallons and —— quarts.
22. Twenty-four cents are —— dimes and —— cents.
23. Twenty-four tenths are —— and —— tenths.
24. Twenty-four sevenths are —— and —— sevenths.
25. Twenty-four fifths are —— and —— fifths.
26. Twenty-four days are —— weeks and —— days.
27. Twenty-two quarts are —— pecks and —— quarts.
28. Twenty-two quarts are —— gallons and —— quarts.

1. Twelve pairs of boots are —— boots.
2. Three spiders have —— legs.
3. Three house-flies have —— legs.
4. Three cats have —— feet.
5. Eleven spans of horses are —— horses.
6. Five butterflies have —— wings.
7. A cat has —— toes on each front foot and —— toes on each hind foot. A cat has —— toes.
8. Eight three-cent stamps cost —— cents.
9. Eight 2-cent stamps cost —— cents.
10. A boy wears 2 shoes. A horse wears 4 shoes. An ox wears 8 shoes. Three boys need —— shoes. 3 horses need —— shoes. 3 oxen need —— shoes.
11. What day of the week is it? It is ————. One week from to-day will be ————; 14 days from to-day will be————; 21 days from to-day will be ————; 22 days from to-day will be ————; 20 days from to-day will be ————.
12. Two thirds of 15 lemons are —— lemons.
13. Twelve oranges are two thirds of —— oranges.
14. When 2 oranges cost 8¢, 3 oranges cost —— cents.
15. When 3 lemons cost 6¢, 4 lemons cost —— cents.
16. Three times 8 square inches are —— square inches.
17. Eight times 3 square inches are —— square inches.
18. At 3¢ each, 7 oranges cost —— cents.
19. At 8¢ each, 3 melons cost —— cents.
20. At 7¢ each, 3 balls cost —— cents.
21. At 3¢ each, 8 pencils cost —— cents.

1. Henry drew an oblong upon his slate. It contained 20 square inches. It was 5 inches long. It was —— inches wide.

2. An oblong that is 3 inches by 7 inches contains —— square inches. Its perimeter is —— inches. 7 + 7 + 3 + 3 =

3. The area of an oblong that is 2 inches by 8 inches is —— square inches. 8 sq. in. × 2 =

4. The perimeter of an oblong that is 2 inches by 8 inches is —— inches. 8 + 8 + 2 + 2 =

5. A square whose area is 16 square inches is a —— inch square.

6. I am thinking of an oblong whose area is 21 square inches. It is 7 inches long. It is —— inches wide.

7. I am thinking of a triangle, each side of which is 2 inches long. The perimeter of the triangle is —— inches.

8. I am thinking of a triangle, each side of which is 4 feet long. The perimeter of the triangle is —— feet.

9. The sum of 10 feet and 2 feet is —— feet.
10. The difference of 10 feet and 2 feet is —— feet.
11. *There can be no product of 10 feet and 2 feet.*
12. The product of 10 feet and 2 is —— feet.
13. The quotient of 10 feet divided by 2 feet is ——.
14. The quotient of 10 feet divided by 2 is —— feet.

15. The quotient of 15 feet divided by 3 feet is ——.
16. The quotient of 15 feet divided by 3 is —— feet.

17. The quotient of 21 feet divided by 3 feet is ——.
18. The quotient of 21 feet divided by 3 is —— feet.
19. The perimeter of a figure is 18 feet; each side is 6 feet; the figure is a ——.

1. Peter lives $4\frac{1}{2}$ miles west of Lake Michigan; Herbert lives $2\frac{1}{2}$ miles west of Peter; Herbert lives —— miles west of the lake.

2. When the temperature is 6 degrees below the freezing point, it is —— degrees above zero.

3. Samuel has two pieces of rope; one piece is 8 feet long; the other piece is 3 yards long; together they are — feet long.

4. When apples cost $2\frac{1}{2}$ dollars a barrel, 3 barrels cost —— dollars.

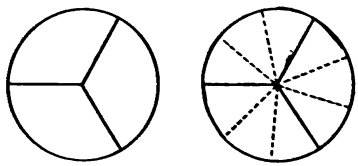
5. 3 pecks)24 pecks. This means find how many times 3 pecks are contained in 24 pecks. Three pecks are contained in 24 pecks —— times.

6. 3)24 pecks. This means find one third of 24 pecks. One third of 24 pecks is —— pecks.

(1) Read, and give products.* (2) Copy and multiply. (3) Tell number stories.

21	21	21	21	21
5	6	7	8	9
102	102	102	102	102
5	6	7	8	9
103	103	103	103	104
5	6	7	8	9
111	111	111	111	111
5	6	7	8	9

* Help the pupil to think in the order suggested by the following: Teacher. 21 multiplied by 6? Pupil. 120, 126. Teacher. 102 multiplied by 6? Pupil. 600, 612.



1. One whole is —— ninths.
2. One third is —— ninths
3. Two thirds are —— ninths.
4. One third and 1 ninth are —— ninths.
5. One third less 1 ninth are —— ninths.
6. Two thirds and 1 ninth are —— ninths.
7. Two thirds less 1 ninth are —— ninths.
8. One third and 2 ninths are —— ninths.
9. One third less 2 ninths is —— ninth.
10. Two thirds and 2 ninths are —— ninths.
11. Two thirds less 2 ninths are —— ninths.

12. Four times 2 ninths are —— ninths.
13. Three times 2 ninths are —— ninths.

14. Two ninths are contained in 8 ninths —— times.
15. Two ninths are contained in $1\frac{1}{9}$ —— times.

16. One half of 1 third is —— —.
17. One third of 1 third is —— ——.

18. The sum of $2\frac{1}{9}$ and $1\frac{1}{9}$ is —— and —— ninths.
19. The difference of $2\frac{1}{9}$ and $1\frac{1}{9}$ is ——————.
20. The product of $2\frac{1}{9}$ multiplied by 2 is ——————.
21. The quotient of $1\frac{1}{9}$ divided by $\frac{1}{9}$ is ——.*
22. The quotient of $\frac{1}{9}$ divided by 3 is ——————.†
23. The quotient of $6\frac{1}{9}$ divided by 3 is ——————.‡

* The pupil must find how many times $\frac{1}{9}$ is contained in $1\frac{1}{9}$.
† The pupil must find $\frac{1}{3}$ of $\frac{1}{9}$.
‡ The pupil must find $\frac{1}{3}$ of $6\frac{1}{9}$.

Review page 89.

1. If each third of a pie should be divided into 3 equal pieces, each piece would be ——— of a pie. A hungry boy would think these very small pieces.

2. $\frac{1}{3}$ of a pie + $\frac{1}{9}$ of a pie = $2\frac{1}{3} + 2\frac{1}{9}$ =
3. $\frac{1}{3}$ of a pie − $\frac{1}{9}$ of a pie = $4\frac{1}{3} - 2\frac{1}{9}$ =
4. $2\frac{2}{9}$ of a pie × 4 = $3\frac{2}{9} \times 4$ =
5. $2\frac{1}{3}$ pies ÷ $\frac{1}{3}$ of a pie = * $2\frac{1}{3} \div \frac{1}{6}$ = *
6. $4\frac{1}{3}$ pies ÷ 2 = * $8\frac{1}{3} \div 2$ = *

7. One foot is 1 third of a yard.†
8. One third of a foot is 1 ninth of a yard.†
9. Three ninths of a yard are 1 ——— of a yard.
10. Six ninths of a yard are —— thirds of a yard.

11. $\frac{2}{3}$ of a yard and $\frac{1}{9}$ of a yard = $2\frac{2}{3} + 2\frac{1}{9}$ =
12. $\frac{2}{3}$ of a yard less $\frac{1}{9}$ of a yard = $4\frac{2}{3} - 2\frac{1}{9}$ =
13. $\frac{2}{9}$ of a yard × 3 = * $2\frac{2}{9} \times 3$ = *
14. $1\frac{1}{9}$ yards ÷ $\frac{1}{9}$ of a yard = * $2\frac{1}{9} \div \frac{1}{9}$ = *
15. $6\frac{1}{3}$ yards ÷ 3 = * $9\frac{1}{3} \div 3$ = *
16. $6\frac{1}{3}$ yards ÷ 2 = * $6\frac{1}{3} \div 2$ = *

17. Henry had two pieces of rope; one was $2\frac{1}{9}$ yards long; the other was $3\frac{2}{9}$ yards long; together they were ——— and ——— ——— yards long.
18. One and $\frac{1}{3}$ yards and $1\frac{1}{9}$ yards are ————.
19. The sum of $5\frac{1}{3}$ yards and $2\frac{1}{9}$ yards is ——— and ——— ——— yards.

* If the pupil hesitates, ask him to tell the meaning of the expression. See page 89.

† Show this by a line upon the blackboard.

Four number facts to be memorized.

12 fives are 60. 11 fives are 55.

5 twelves are 60. 5 elevens are 55.

1. Can you add column (a) in fifteen seconds, beginning at the top?

2. Can you add column (a) in fifteen seconds, beginning at the bottom?

3. Practice until you can do this with each column.

4. Ten fives are ——.

5. Eleven fives are ——.

6. Twelve fives are ——.

7. Twenty fives are ——.

8. $28 + 5 =$ $38 + 5 =$

9. $48 + 5 =$ $58 + 5 =$

10. $68 + 5 =$ $78 + 5 =$

11. $19 + 5 =$ $39 + 5 =$

12. $49 + 5 =$ $29 + 5 =$

13. $69 + 5 =$ $89 + 5 =$

14. $67 + 5 =$ $37 + 5 =$

15. $27 + 5 =$ $17 + 5 =$

16. $16 + 5 =$ $36 + 5 =$ $46 + 5 =$

17. $26 + 5 =$ $56 + 5 =$ $96 + 5 =$

(a)	(b)	(c)	(d)	(e)
5	2	4	5	5
5	5	5	5	4
5	5	5	5	3
5	5	5	4	2
5	5	5	5	1
5	5	5	5	3
5	5	5	5	4
5	5	5	3	2
5	5	5	5	5
5	5	5	5	1
5	5	5	5	5
5	5	5	2	3
5	5	5	5	4
5	5	5	5	2
5	5	5	5	1
5	5	5	1	5
5	5	5	5	4
5	5	5	5	2
5	5	5	5	3
5	5	5	4	4
1	3	5	5	3
—	—	—	—	—

18. Lewis had one dollar; he bought 12 tablets at 5¢ each; he then had —— cents.

19. At 5¢ each 20 tablets cost ————.

20. At 5¢ each 19 tablets cost ————.

21. At 5¢ each 18 tablets cost ————.

Review page 88.

1. Eight feet are —— and —— —— yards.
2. Three is contained in 8 —— and —— —— times.
3. Three is contained in 11 —— and —— —— times.

4. Ten pecks are —— and —— —— bushels.
5. Four is contained in 10 —— and —— —— times.
6. Four is contained in 14 —— and —— —— times.

7. In 12 there are —— fives and —— remainder.
8. Five is contained in 12 —— and —— —— times.
9. Five is contained in 17 —— and —— —— times.

10. In 14 there are —— sixes and —— remainder.
11. Six is contained in 14 —— and —— —— times.
12. Six is contained in 15 —— and —— —— times.

13. Five is contained in 21 —— and —— —— times.
14. Five is contained in 23 —— and —— —— times.
15. Five is contained in 27 —— and —— —— times.

(1) Read, and give quotients * (2) Copy and divide. (3) Tell number stories.

3)36	3)336	3)636	3)933
3)18	3)318	3)618	3)912
3)15	3)315	3)615	3)912
3)12	3)312	3)612	3)909

* Observe the double nature of these problems. (a) One third of 36 is 12. (b) 3 is contained in 36, 12 times. See foot-note, page 58.

1. \$9 + \$7, means ————.* \$9 and \$7 =
2. \$9 − \$7, means ————. \$9 less \$7 =
3. \$9 × 2, means ————. 2 times \$9 =
4. \$9 ÷ \$2, means ———— ——. \$2 are ————.
5. \$9 ÷ 2, means ———— ——. $\frac{1}{2}$ of \$9 =

6. \$$\frac{1}{2}$ + \$$\frac{1}{10}$, means ————. \$$\frac{1}{2}$ and \$$\frac{1}{10}$ =
7. \$$\frac{1}{2}$ − \$$\frac{1}{10}$, means ————. \$$\frac{1}{2}$ less \$$\frac{1}{10}$ =
8. \$$\frac{3}{10}$ × 5, means ———— . 5 times \$$\frac{3}{10}$ =
9. \$$\frac{9}{10}$ + \$$\frac{2}{10}$, means ———— ————. \$$\frac{2}{10}$ are ————.
10. \$$\frac{8}{10}$ ÷ 2, means ————. $\frac{1}{2}$ of \$$\frac{8}{10}$ =

11. \$.6 + \$.3, means ———— ——. \$.6 + \$.3 =
12. \$1 − \$.3, means ———— ——. \$1 − \$.3 =
13. \$.5 × 4, means ———— —. 4 times \$.5 =
14. \$1.5 ÷ \$.3, means ———— ————.† \$.3 are ————.
15. \$1.8 ÷ 3, means ————. $\frac{1}{3}$ of ————.

16. Arthur had \$4.2; he earned \$1.5; he then had —— and ———— —— dollars.
17. Fred had \$3.6; he spent \$1.5; he then had —— and ———— —— dollars.
18. James earned \$.3 each day; in 4 days he earned ————.
19. When coffee cost \$.3 a pound, for \$1.2 I can buy —— pounds.
20. Harris paid \$1.5 for 3 pounds of tea; 1 pound cost ————.
21. \$.7)\$2.1 This means ——. 7)\$2.1 This means ——.

* Complete as indicated on page 89. Teach the meaning and use of the dollar sign.

† This means find how many times 3 tenths of a dollar are contained in 15 tenth-dollars. See foot-note, page 70.

Review pages 70, 80, and 90.

1. Write in figures using the decimal point; 16 tenths, 23 tenths, 41 tenths, 2 and 5 tenths.

2. Read the following in two ways: 1.9, 2.7, 3.4.

(1) Read, and give sums. (2) Copy and add. (3) Tell number stories.*

$33\frac{1}{5}$	$42\frac{2}{5}$	$24\frac{8}{10}$	24.2	43.5
$2\frac{2}{5}$	2.2	$3\frac{5}{10}$	3.5	7.2

(1) Read, and give differences. (2) Copy and subtract. (3) Tell number stories *

36	44	37	37.5	56.7
$2\frac{1}{5}$	$2\frac{6}{10}$	2.6	2.3	5.3

(1) Read, and give products. (2) Copy and multiply. (3) Tell number stories.*

$12\frac{1}{2}$	$12\frac{1}{4}$	12.5	$8\frac{1}{3}$	$7\frac{1}{2}$
3	3	3	3	3

(1) Read problems and tell their meaning. (2) Give quotients. (3) Copy and divide. (4) Tell number stories.*

\$5)\$15	5 tenths)15 tenths	.5)1.5	
5)\$15	5)15 tenths	5)\$1.5	3)\$1.8

* See foot-note, page 80.

Five number facts to be memorized.
4 sixes are 24. 6 fours are 24.
3 nines are 27. 9 threes are 27.
5 fives are 25.

1. Twenty-four pecks are —— bushels.
2. Twenty-four sixths are —— wholes.
3. Twenty-seven feet are —— yards.
4. Twenty-seven ninths are —— wholes.
5. Twenty-five fifths are —— wholes.

6. 25 is —— 6's and ——. 26 is —— 4's and ——.
7. 27 is —— 4's and ——. 26 is —— 6's and ——.
8. 28 is —— 9's and ——. 29 is —— 3's and ——.
9. 29 is —— 6's and ——. 29 is —— 4's and ——.

10. 6 bushels are —— pecks. 5 bushels =
11. 9 yards are —— feet. 8 yards =

12. Twenty-five inches are —— feet and —— inch.
13. Twenty-five quarts are —— pecks and —— quart.
14. Twenty-six days are —— weeks and —— days.
15. Twenty-six dimes are —— dollars and —— dimes.
16. Twenty-seven quarts are —— gallons and —— quarts.
17. Twenty-eight feet are —— yards and —— foot.

18. Six bushels and 2 pecks are —— pecks.
19. Five bushels and 3 pecks are —— pecks.
20. Nine yards and 2 feet are —— feet.
21. Eight yards and 1 foot are —— feet.
22. Three feet and 3 inches are —— inches.
23. Five gallons and 3 quarts are —— quarts.

3 2's are ——. 3 3's are ——. 3 4's are ——.
3 5's are ——. 3 6's are ——. 3 7's are ——.
3 8's are ——. 3 9's are ——. 3 10's are ——.

1. Two thirds of 18 apples are —— apples.
2. Eighteen apples are two thirds of —— apples.
3. Three fourths of 12 oranges are —— oranges.
4. Twelve oranges are three fourths of —— oranges.
5. When 3 lemons cost 12¢, 4 lemons cost —— cents.
6. When 2 melons cost 18¢, 3 melons cost —— cents.
7. Mr. Smith earns 12 dollars a week; this is two thirds as much as Mr. Brown earns; Mr. Brown earns —— dollars.
8. Eight is two thirds of ——. 12 is two thirds of ——. 18 is two thirds of ——.
9. The first day of July, 1895, was Monday; the next Monday was the ——th; the ninth was ——; the seventh was ——.
10. Nine 3-cent stamps cost —— cents.
11. Six 4-cent stamps cost —— cents.
12. Five 5-cent stamps cost —— cents.
13. At $9 a ton, 3 tons of hay cost —— dollars.
14. At $6 a ton, 4 tons of coal cost —— dollars.
15. At $3 each, 9 hats cost —— dollars.
16. At $4 each, 6 sheep cost —— dollars.
17. At $3 each, 8 calves cost —— dollars.
18. Six spoons are a set; 24 spoons are —— sets; 18 spoons are —— sets.
19. When kerosene is 9¢ a gallon, for 27¢ I can buy —— gallons.
20. When wood is $6 a cord, for $24 I can buy —— cords; for $27 I can buy —— cords.
21. When sugar is 4¢ a pound, for 24¢ I can buy —— pounds; for 26¢ I can buy —— pounds.
22. When ribbon is 8¢ a yard, for 28¢ I can buy —— yards.

1. If I should draw an oblong 3 inches wide and 9 inches long, and then divide it into 1-inch squares, there would be ——— rows of squares. An oblong 3 inches by 9 inches contains ——— square inches.

2. Three times 9 square inches are ——— square inches.

3. Nine times 3 square inches are ——— square inches.

4. The area of an oblong that is 4 inches by 6 inches is ——— square inches. 6 sq. in. × 4 =

5. The perimeter of an oblong that is 4 inches by 6 inches is ——— inches. 6 + 6 + 4 + 4 =

6. A square whose area is 25 square inches is a ——— inch square.

7. The perimeter of a 5-inch square is ——— inches.

8. I am thinking of a pentagon, each side of which is 4 inches. The perimeter of this pentagon is ——— inches.

9. I am thinking of a triangle, each side of which is 9 inches. The perimeter of this triangle is ——— inches.

10. The sum of 9 inches and 3 inches is ——— inches.

11. The difference of 9 inches and 3 inches is ——— inches.

12. *There can be no product of 9 inches and 3 inches.*

13. The product of 9 inches and 3 is ——— inches.

14. The quotient of 27 inches divided by 3 inches is ——— .

15. The quotient of 27 inches divided by 3 is ——— inches.

16. The quotient of 24 inches divided by 4 inches is ———.

17. The quotient of 24 inches divided by 4 is ——— inches.

18. The quotient of 24 inches divided by 6 inches is ———.

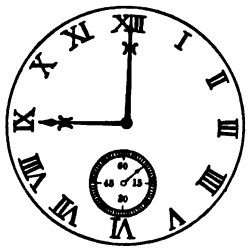
19. The quotient of 24 inches divided by 6 is ——— inches.

20. The quotient of 32 feet divided by 4 feet is ———.

21. The quotient of 32 feet divided by 4 is ——— feet.

Three number facts to be memorized.

60 seconds are 1 minute.
60 minutes are 1 hour.
24 hours are 1 day.*



Three number facts to be memorized.

1 half-hour is 30 minutes.
½ of an hour is 15 minutes.
¾ of an hour are 45 minutes.

1. When the long hand of a clock points to XII and the short hand to IX, it is —— o'clock.

2. When the long hand points to XII and the short hand to IV, it is —— o'clock.

3. At 5 minutes past 9, the long hand points to ——. At "half past 3", the long hand points to ——. At "quarter past 6", the long hand points to ——. At 20 minutes past 8, the long hand points to ——.

4. "Half past 9" is usually printed 9:30.

5. "Quarter past 9" is usually printed 9:15.

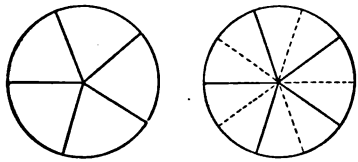
6. "Quarter of ten" is usually printed 9:45.

Slate Work in Addition.

(a)	(b)	(c)	(d)	(e)
235	224	253	227	215
36	48	29	36	28

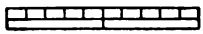
(f)	(g)	(h)	(i)	(j)
214	215	342	234	423
122	342	253	325	576

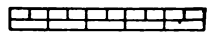
* Explain to the pupil the double meaning of the word day. Teach the Roman numerals to XII, and to tell the time by the clock, if this has not been done before.



1. One whole is —— tenths.
2. One fifth is —— tenths.
3. Two fifths are —— tenths.
4. Three fifths are —— tenths.
5. Four fifths are —— tenths.
6. One fifth and 1 tenth are —— tenths.
7. One fifth less 1 tenth is —— tenth.
8. Two fifths and 4 tenths are —— tenths.
9. Two fifths less 1 tenth are —— tenths.
10. Three fifths and 1 tenth are —— tenths.
11. Three fifths less 1 tenth are —— tenths.
12. Four fifths and 1 tenth are —— tenths.
13. Four fifths less 1 tenth are —— tenths.
14. Four fifths and three tenths are —— tenths.
15. Four fifths less 3 tenths are —— tenths.
16. Three fifths and 3 tenths are —— tenths.
17. Three fifths less 3 tenths are —— tenths.
18. Four times 2 tenths are —— tenths.
19. Three times 3 tenths are —— tenths.
20. Two tenths are contained in 6 tenths — times.
21. One tenth is contained in 1 fifth —— times.
22. Two tenths are contained in 1 whole —— times.
23. Three tenths are contained in 1 whole ————.*
24. One half of 1 fifth is —— ——.
25. One half of 3 fifths is —— ——.
26. One half of 2 fifths is —— ——.

* See problem 6, page 88.





1. Sometimes inches are divided into fifths and tenths. Perhaps the teacher can show you a rule so divided.

2. $\frac{1}{5}$ of an inch + $\frac{1}{10}$ of an in. = $3\frac{1}{5} + 2\frac{1}{10}$ =

3. $\frac{1}{5}$ of an inch − $\frac{1}{10}$ of an in. = $4\frac{1}{5} - 2\frac{1}{10}$ =

4. $\frac{3}{10}$ of an inch × 3 = * $2\frac{3}{10} \times 3$ =*

5. $2\frac{1}{5}$ in. ÷ $\frac{1}{5}$ of an inch = * $1\frac{1}{5} \div \frac{1}{10}$ =*

6. $6\frac{1}{5}$ in. ÷ 2 = * $8\frac{1}{5} \div 2$ =*

7. Draw a line $2\frac{2}{5}$ inches long; draw another line $2\frac{1}{10}$ inches long; together the lines are —— and —— tenths inches long. $2\frac{2}{5} + 2\frac{1}{10}$ =

8. Draw a line 3 inches long; erase from it $1\frac{3}{10}$ inches; the line that is left is —— and —— tenths inches long. $3 - 1\frac{3}{10}$ =

9. William drew a square. Each side of it was $1\frac{1}{10}$ inches. We might call it a $1\frac{1}{10}$-inch square. The perimeter of the square was —— and —— —— inches. $1\frac{1}{10} \times 4$ =

10. Egbert had a piece of copper wire $1\frac{1}{2}$ inches long. He divided it into pieces each of which was $\frac{1}{10}$ of an inch long. There were —— pieces. $1\frac{1}{2} \div \frac{1}{10}$ =

11. Herbert had a piece of silver wire 1.2 inches long. He divided it into 3 equal parts. Each part was —— —— of an inch long. 1.2 in. ÷ 3 = $1\frac{2}{10}$ in. ÷ 3 =

12. 2.4 inches ÷ .4 of an inch =† 2.4 inches ÷ 4 =†

* If the pupil hesitates ask him to tell the meaning of the expression. See page 89.

† What does the expression mean?

Four number facts to be memorized.

12 sixes are 72. 11 sixes are 66.
6 twelves are 72. 6 elevens are 66.

1. Can you add column (a) in fifteen seconds, beginning at the top?

2. Can you add column (a) in fifteen seconds, beginning at the bottom?

3. Practice until you can do this with each column.

4. Ten sixes are ——.

5. Eleven sixes are ——.

6. Twelve sixes are ——.

7. Twenty sixes are ——.

8. $27 + 6 =$	$37 + 6 =$	
9. $17 + 6 =$	$47 + 6 =$	
10. $87 + 6 =$	$67 + 6 =$	
11. $86 + 6 =$	$46 + 6 =$	
12. $36 + 6 =$	$56 + 6 =$	
13. $16 + 6 =$	$26 + 6 =$	
14. $48 + 6 =$	$58 + 6 =$	$18 + 6 =$
15. $28 + 6 =$	$38 + 6 =$	$68 + 6 =$

(a)	(b)	(c)	(d)	(e)
6	2	4	6	6
6	6	6	6	2
6	6	6	6	1
6	6	6	5	3
6	6	6	6	5
6	6	6	6	4
6	6	6	6	6
6	6	6	4	3
6	6	6	6	2
6	6	6	6	5
6	6	6	6	1
6	6	6	3	4
6	6	6	6	6
6	6	6	6	1
6	6	6	6	4
6	6	6	6	5
6	6	6	2	3
1	3	5	6	2
				6
				3
				1
				2
				5
				4
				3

Read and give sums.

29	49	19	25	45
6	6	6	6	6
35	54	35	74	45
6	6	6	6	6

1. Two is contained in 11 ——— times and ——— over.
2. Two is contained in 11 ——— and ——— half times.

3. 3 is contained in 13 ——— times and ——— over.
4. 3 is contained in 13 ——— and ——— ——— times.

5. 3 is contained in 11 ——— times and ——— over.
6. 3 is contained in 11 ——— and ——— ——— times.

7. 3 is contained in 14 ——— times and ——— over.
8. 3 is contained in 14 ——— and ——— ——— times.

9. 4 is contained in 17 ——— times and ——— over.
10. 4 is contained in 17 ——— and ——— ——— times.

11. 4 is contained in 19 ——— times and ——— over.
12. 4 is contained in 19 ——— and ——— ——— times.

13. 5 is contained in 22 ——— times and ——— over.
14. 5 is contained in 22 ——— and ——— ——— times.

15. 5 is contained in 33 ——— times and ——— over.
16. 5 is contained in 33 ——— and ——— ——— times.

17. 5 is contained in 42 ——— times and ——— over.
18. 5 is contained in 42 ——— and ——— ——— times.

Slate Work in Subtraction.

(a)	(b)	(c)	(d)	(e)
452	368	540	486	374
126	139	225	218	137
(f)	(g)	(h)	(i)	(j)
346	475	560	494	562
27	38	28	36	46
(k)	(l)	(m)	(n)	(o)
275	341	462	374	443
116	122	143	135	214

1.	20 ft. + 17 ft., means ———.*	20 ft. and 17 ft. =
2.	20 ft. − 17 ft., means ———.*	20 ft. less 17 ft. =
3.	20 ft. × 2, means ———.*	2 times ———.
4.	20 ft. ÷ 4 ft., means ———.*	4 ft. are contained ———.
5.	20 ft. ÷ 4, means ———.*	$\frac{1}{4}$ of ———.
6.	$\frac{1}{2}$ ft. + $\frac{1}{6}$ ft., means ——— .	$\frac{1}{2}$ ft. and $\frac{1}{6}$ ft. =
7.	$\frac{1}{2}$ ft. − $\frac{1}{6}$ ft., means ———.	$\frac{1}{2}$ ft. less $\frac{1}{6}$ ft. =
8.	$2\frac{1}{6}$ ft. × 4, means ———.	4 times ———.
9.	$\frac{5}{6}$ ft. ÷ $\frac{2}{6}$ ft., means ———.	$\frac{2}{6}$ ft. are contained ———.
10.	$6\frac{1}{2}$ ft. ÷ 3, means ———.	$\frac{1}{3}$ of ———.
11.	.8 in. + .4 in., means ———.†	.8 in. and .4 in. =
12.	1.2 in. − .5 in., means ——— .	1.2 in. less .5 in. =
13.	1.2 in. × 3, means ———.	3 times ———.
14.	1.6 in. ÷ .4 in., means ———.	.4 in. are contained ———
15.	1.6 in. ÷ 4, means ———.	$\frac{1}{4}$ of ———.

16. Bennie lives 1 tenth of a mile north of the schoolhouse; Harry lives 1 fifth of a mile south of the schoolhouse; from Bennie's home to Harry's home it is ————.

17. John lives 2 miles from the schoolhouse; Peter lives 1 and 3 tenths miles from the schoolhouse. How much farther is John's home from the schoolhouse than Peter's? It is ————————.

18. Harvey rode on his bicycle 2 and 3 tenths miles; Ernest rode 3 times as far; Ernest rode ————————.

19. Alice rode 4.2 miles; this is twice as far as Mary rode; Mary rode ————————.

20. One fourth of 12.8 miles is ————————.

21. Three fourths of 12.8 miles are ————————.

22. Twelve and 4 tenths miles are two thirds of ———————— miles.

23. Twelve and 4 tenths miles are one half of ———————— miles.

* Complete as indicated on page 89.

† .8 in. may be read 8 tenths of an inch, or it may be read 8 tenth-inches.

Slate Work in Addition.

(a)	(b)	(c)	(d)
$46\frac{2}{5}$	$38\frac{3}{10}$	38.3	4 ft. 5 in.
$37\frac{1}{10}$	$24\frac{2}{10}$	24.2	7 ft. 3 in.

(e) Find the sum of forty-five and three tenths, and thirty-six and one tenth.

Slate Work in Subtraction.

(a)	(b)	(c)	(d)
$74\frac{3}{5}$	$47\frac{7}{10}$	47.7	12 ft. 8 in.
$21\frac{1}{10}$	$24\frac{1}{10}$	24.1	4 ft. 6 in.

(e) Find the difference of sixty-six and three tenths, and twenty-three and one fifth.

Slate Work in Multiplication.

(a)	(b)	(c)	(d)
$32\frac{3}{10}$	$43\frac{4}{10}$	43.4	6 ft. 2 in.
3	2	2	4

(e) Find the product of fifty-three and two fifths multiplied by two.

Slate Work in Division.*

(a)	(b)	(c)
\$3)\$24	3 tenths)24 tenths	.3)2.4
(d)	(e)	(f)
3)\$24	3)24 tenths	3)2.4
(g)	(h)	(i)
2)246	2)645	$2)846\frac{1}{2}$

* Require the pupils to tell the meaning of each problem in division before attempting to divide. Observe the double meaning of the last three problems. Problem (g) may mean find $\frac{1}{2}$ of 246, or it may mean find how many times 2 is contained in 246.

Six number facts to be memorized.

4 sevens are 28. 5 sixes are 30.
7 fours are 28. 6 fives are 30.
4 eights are 32. 8 fours are 32.

1. Thirty-two pecks are —— bushels.
2. Twenty-four quarts are —— pecks.
3. Twenty-eight days are —— weeks.
4. Twenty-eight fourths are —— wholes.
5. Thirty fifths are —— wholes.

6. 30 is —— 7's and ——. 30 is —— 9's and ——.
7. 30 is —— 4's and ——. 31 is —— 6's and ——.
8. 32 is —— 5's and ——. 32 is —— 3's and ——.
9. 7 bushels are —— pecks. 6 bushels =
10. 4 weeks are —— days. 3 weeks =
11. 10 yards are —— feet. 9 yards =
12. Thirty inches are —— feet and —— inches.
13. Thirty days are —— weeks and —— days.
14. Thirty-one quarts are —— gallons and ——.
15. Thirty-two dimes are —— dollars and ——.
16. Thirty-three pecks are —— bushels and ——.
17. Thirty-four quarts are —— pecks and ——.
18. Four weeks and 3 days are —— days.
19. Ten yards and 2 feet are —— feet.
20. Seven bushels and 3 pecks are —— pecks.
21. Two feet and 8 inches are —— inches.
22. Four pecks and 1 quart are —— quarts.
23. Six gallons and 3 quarts are —— quarts.
24. $3\frac{1}{2}$ are —— halves. $4\frac{1}{2}$ are ——.
25. $3\frac{1}{3}$ are —— thirds. $4\frac{1}{3}$ are ——.
26. $3\frac{1}{4}$ are —— fourths. $4\frac{1}{4}$ are ——.
27. $3\frac{1}{5}$ are —— fifths. $4\frac{1}{5}$ are ——.
28. $3\frac{2}{5}$ are —— fifths. $4\frac{2}{5}$ are ——.
29. $5\frac{1}{5}$ are —— fifths. $6\frac{1}{5}$ are ——.
30. $4\frac{3}{4}$ are —— fourths. $5\frac{1}{4}$ are ——.

1. The sum of $12 and $4 is —— dollars.

(a) Find the sum of $84 and $43.*

2. The difference of $12 and $4 is —— dollars.

(b) Find the difference of $85 and $42.

There can be no product of $8 and $4.

3. The product of $8 and 4 is —— dollars.

(c) Find the product of $82 and 4.

4. The quotient of $28 divided by $7 is ——.

(d) Find the quotient of $628 divided by $2.

5. The quotient of $28 divided by 7 is ——.

(e) Find the quotient of $628 divided by 2.

6. A lady bought 4 yards of gingham at 8¢ a yard; she gave the salesman half a dollar; she should receive in change —— cents.†

7. A man paid $8 for a watch; he paid $4 for repairing it; he then sold the watch for $15; he gained —— dollars.

8. Alice paid 8¢ for pens, 5¢ for a pencil and 5¢ for paper. If she gave the salesman 1 fourth of a dollar, how much change should she receive? She should receive ——.

9. Peter had half a dollar; he spent 1 tenth of a dollar, he had —— cents left.

10. George had a quarter of a dollar; he spent 1 tenth of a dollar; he had —— cents left.

11. Richard played ball half an hour and he played "hide and seek" 10 minutes; in all he played —— minutes.

12. Helen practiced her music lesson from 7:30 to 8:45; she practiced —— hour and —— minutes.

* Problems designated by *letters* are for the slate.

† Teach the child to find the difference between 32¢ and 50¢ by finding how many cents he must add to 32¢ to make 50¢. The following figures will suggest the method: 32, 8, 18; that is, the child will think that he must add 8 and 10 to 32 to make 50.

1. If I should draw an oblong 4 inches wide and 8 inches long and then divide it into 1-inch squares, there would be —— rows of squares and in each row there would be —— squares.

2. The area of an oblong 4 inches by 8 inches is —— square inches. 8 sq. in. × 4 = 4 sq. in. × 8 =

3. The perimeter of an oblong 8 inches by 4 inches is —— inches. 8 in. + 8 in. + 4 in. + 4 in. =

4. The first day of August, 1895, was Thursday; the next Thursday was the ——th; the ninth was ——; the seventh was ————.

5. Eight 4-cent stamps cost —— cents.

6. At 5¢ a quart, 6 quarts of milk cost —— cents; 5 quarts cost —— cents.

7. At 4¢ a quart, 7 quarts of milk cost —— cents; $8\frac{1}{2}$ quarts cost —— cents.

8. A man agreed to pay $4 a day for keeping his family at a hotel. One week's board will cost —— dollars.

9. It takes five minutes for Alice to go home from school; Mary lives farther away and it takes her six times as long; it takes Mary —— minutes to go home from school. Alice and Mary started for home at 3:15; Alice reached home at ————; Mary reached home at ————.

10. John rode 32 miles in 4 hours; he rode at the rate of ———— miles an hour. 32 miles ÷ 4 =

11. Henry rode 33 miles in 4 hours; he rode at the rate of ———— miles an hour. 33 miles ÷ 4 =

12. Peter rode 35 miles in 4 hours; he rode at the rate of ———— miles an hour. 35 miles ÷ 4 =

13. Clarence rode 29 miles in 5 hours; he rode at the rate of ———— miles an hour. 29 miles ÷ 5 =

1. Four and one half times 6, means, *4 sixes and 1 half of six.* $4\frac{1}{2}$ times 6 =

2. $6 \times 2\frac{1}{2}$ *, means, *$2\frac{1}{2}$ *times 6, or 2 sixes and* $\frac{1}{2}$ *of six.* $2\frac{1}{2}$ times 6 = $6 \times 2\frac{1}{2}$ =

3. Notice carefully the following:

4 tons at \$8 a ton;	\$8 × 4 =
3 tons at \$8 a ton;	\$8 × 3 =
2 tons at \$8 a ton;	\$8 × 2 =
1 ton at \$8 a ton;	\$8 × 1 =
$\frac{1}{2}$ ton at \$8 a ton;	\$8 × $\frac{1}{2}$ =
$\frac{1}{4}$ ton at \$8 a ton;	\$8 × $\frac{1}{4}$ =
$2\frac{1}{2}$ tons at \$8 a ton;	\$8 × $2\frac{1}{2}$ =
$2\frac{1}{4}$ tons at \$8 a ton;	\$8 × $2\frac{1}{4}$ =

4. *Remember that to multiply a number by* $\frac{1}{2}$ *is to get* $\frac{1}{2}$ *of that number;* to multiply by $\frac{1}{4}$ ————.

5. $10 \times \frac{1}{2}$, means, $\frac{1}{2}$ of ten. $10 \times \frac{1}{2}$, means ————.*

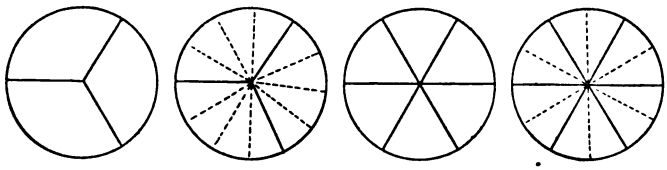
Slate Work in Multiplication.

(a)	(b)	(c)	(d)	(e)
24	28	26	22	20
$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$

(f)	(g)	(h)	(i)	(j)
42	44	46	50	48
$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$

(k)	(l)	(m)	(n)	(o)
62	64	16	82	84
$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{2}$

* Teachers will remember that in this book the sign × stands for *multiplied by*, not *times*.



1. One third is —— twelfths.
2. One sixth is —— twelfths.
3. Two thirds are —— twelfths.
4. Two sixths are —— twelfths.
5. Three sixths are —— twelfths.
6. Five sixths are —— twelfths.

7. One third and 1 twelfth are —— twelfths.
8. One third less 1 twelfth are —— twelfths.
9. Two thirds and 1 twelfth are —— twelfths.
10. Two thirds less 1 twelfth are —— twelfths.
11. One third and 5 twelfths are —— twelfths.

12. One sixth and 1 twelfth are —— twelfths.
13. One sixth less 1 twelfth is —— twelfth.
14. Five sixths and 1 twelfth are —— twelfths.
15. Five sixths less 1 twelfth are —— twelfths.

16. Seven twelfths and 1 sixth are —— twelfths.
17. Seven twelfths and 1 third are —— twelfths.

18. Two times 5 twelfths are —— twelfths.
19. Three times 5 twelfths are ——.

20. Two twelfths are contained in 1 half —— times.
21. Two twelfths are contained in 1 whole ——.
22. One twelfth is contained in 1 sixth ——.
23. Five twelfths are contained in 1 whole ——.*

24. One half of 1 sixth is ——.
25. One fourth of 1 third is ——.

* See problem 8, page 98.

1. One inch is ——— ——— of a foot.
2. Two inches are ——— ——— of a foot.*
3. Three inches are ——— ——— of a foot.
4. Four inches are ——— ——— of a foot.
5. Five inches are ——— ——— of a foot.
6. Six inches are ——— ——— of a foot.
7. Seven inches are ——— ——— of a foot.
8. Eight inches are ——— ——— of a foot
9. Nine inches are ——— ——— of a foot.
10. Ten inches are ——— ——— of a foot.
11. Eleven inches are ——— ——— of a foot.
12. Thirteen inches are and ——— ——— feet.
13. Fourteen inches are ——— and ——— ——— feet.
14. Fifteen inches are ——— and ——— ——— feet.

15. $\frac{1}{3}$ of a ft. + $\frac{1}{12}$ of a ft. = $3\frac{1}{3} + 3\frac{1}{12} =$
16. $\frac{1}{3}$ of a ft. − $\frac{1}{12}$ of a ft. = $4\frac{1}{3} - 2\frac{1}{12} =$
17. $\frac{5}{12}$ of a ft. × 2 = $6\frac{5}{12} \times 2 =$
18. $1\frac{1}{6}$ ft. + $\frac{1}{6}$ of a ft. = $1\frac{1}{6} + \frac{1}{12} =$
19. $6\frac{1}{3}$ ft. ÷ 2 = $6\frac{1}{3} \div 2 =$

20. Draw a line $3\frac{1}{6}$ ft. long; draw another line $4\frac{5}{12}$ ft. long; together the lines are ——— and ——— ——— feet long. $3\frac{1}{6} + 4\frac{5}{12} =$

21. Draw a line 3 ft. long; erase from it $1\frac{5}{12}$ feet; the line that is left is ——— and ——— ——— feet long. $3 - 1\frac{5}{12} =$

22. Henry drew a $1\frac{1}{4}$-foot square. The perimeter of the square was ———. $1\frac{1}{4} \times 4 =$

* The pupil may read such problems as this twice; first, he may say 2 in. are 2 twelfths of a foot; then, 2 in. are 1 sixth of a foot.

Four number facts to be memorized.

12 sevens are 84. 11 sevens are 77.
7 twelves are 84. 7 elevens are 77.

1. Can you add column (a) in fifteen seconds, beginning at the top?

2. Can you add column (a) in fifteen seconds, beginning at the bottom.

4. Practice until you can do this with each column.

4. Ten sevens are ——.

5. Eleven sevens are ——.

6. Twelve sevens are ——.

7. Twenty sevens are ——.

8. $27 + 7 =$ $17 + 7 =$

9. $37 + 7 =$ $57 + 7 =$

10. $46 + 7 =$ $16 + 7 =$

11. $26 + 7 =$ $56 + 7 =$

12. $38 + 7 =$ $18 + 7 =$

13. $48 + 7 =$ $28 + 7 =$

14. $25 + 7 =$ $15 + 7 =$

15. $65 + 7 =$ $45 + 7 =$

(a)	(b)	(c)	(d)	(e)	(f)
7	2	4	6	7	7
7	7	7	7	7	2
7	7	7	7	6	1
7	7	7	7	7	5
7	7	7	7	7	4
7	7	7	7	5	6
7	7	7	7	7	3
7	7	7	7	7	4
7	7	7	7	4	2
7	7	7	7	7	5
7	7	7	7	7	3
7	7	7	7	3	7
7	7	7	7	7	6
7	7	7	7	7	1
7	7	7	7	2	4
1	3	5	7	7	5
—	—	—	—	—	2
					1
					3
					7
					4
					6
					5
					—

$35 + 7 =$

$75 + 7 =$

Read, and give sums.

29	49	19	34	24	53
7	7	7	7	7	7
—	—	—	—	—	—
14	54	23	43	13	85
7	7	7	7	7	7
—	—	—	—	—	—

1. 5 is contained in 11 —— times and —— over.
2. 5 is contained in 11 —— and —— —— times.
3. 5 is contained in 12 times and —— over.
4. 5 is contained in 12 and —— —— times.
5. 5 is contained in 13 times and over.
6. 5 is contained in 13 — and —— —— times.
7. 5 is contained in 14 — and —— times.
8. 5 is contained in 23 — and —— times.
9. 5 is contained in 28 —— and —— times.
10. 5 is contained in 33 —— and —— —— times.
11. 5 is contained in 37 —— and —— times.
12. 5 is contained in 41 —— and —— times.
13. 5 is contained in 48 —— and —— —— times.

14. When milk costs 2¢ a pint, for 7¢ I can buy —— and pints. 7¢ ÷ 2¢ =

15. When ribbon costs 3¢ a yard, for 10¢ I can buy —— and yards. 10¢ ÷ 3¢ =

16. When milk is 4¢ a quart, for 10¢ I can buy —— and —— quarts. 10¢ ÷ 4¢ =

Slate Work in Division.

(a)	(b)	(c)	(d)	(e)
3)37	3)337	3)637	3)938	3)935
(f)	(g)	(h)	(i)	(j)
3)20	3)320	3)620	3)920	3)914
(k)	(l)	(m)	(n)	(o)
3)17	3)317	3)617	3)916	3)913
(p)	(q)	(r)	(s)	(t)
4)17	4)817	4)417	4)821	4)423

1. 30 min. + 15 min., means ——.* 30 min. and 15 min. =
2. 30 min. − 15 min., means ——. 30 min. less 15 min. =
3. 12 min. × 2, means ——. 2 times ——.
4. 12 min. × $2\frac{1}{2}$, means ——.† $2\frac{1}{2}$ times ——.
5. 30 min. ÷ 5 min., means ——. 5 min. are ——.
6. 30 min. ÷ 5, means ——. $\frac{1}{5}$ of ——.

7. $\frac{1}{2}$ ft. + $\frac{5}{12}$ ft., means ——. $\frac{1}{2}$ ft. and $\frac{5}{12}$ ft. =
8. $\frac{1}{2}$ ft. − $\frac{5}{12}$ ft., means ——. $\frac{1}{2}$ ft. less $\frac{5}{12}$ ft. =
9. $3\frac{1}{12}$ ft. × 5, means ——. 5 times ——.
10. 6 ft. × $2\frac{1}{2}$, means ——. $2\frac{1}{2}$ times ——.
11. $2\frac{1}{12}$ ft. ÷ $\frac{1}{12}$ ft., means ——. $\frac{1}{12}$ ft. is ——.
12. $8\frac{1}{6}$ ft. ÷ 2, means ——. $\frac{1}{2}$ of ——.

13. \$.7 + \$.5, means ——. \$.7 and \$.5 =
14. \$1.5 − \$.8, means ——. \$1.5 less \$.8 =
15. \$1.2 × 4, means ——. 4 times ——.
16. \$.6 × $2\frac{1}{2}$, means ——. $2\frac{1}{2}$ times ——.
17. \$2.4 ÷ \$.6, means ——. \$.6 are ——.
18. \$2.4 ÷ 6, means ——. $\frac{1}{6}$ of ——.

Review Page 104.

19. The long hand of a clock moves from I to II in —— minutes; from II to VI in —— minutes.
20. From 9:10 to 9:35 it is —— minutes.
21. From 9:50 to 10:10 it is —— minutes.
22. From 9:45 to 10:15 it is —— minutes.
23. From 9:15 to 9:40 it is —— minutes.
24. From 9:10 to 9:50 it is —— minutes.
25. From 9:30 to 10:25 it is —— minutes.
26. From 9:40 to 10:20 it is —— minutes.

* Complete as indicated on page 89. Teach the abbreviation *min.* for minute or minutes.

† See problem 2, page 114.

Slate Work in Addition.

(a)	(b)	(c)	(d)
$84\frac{7}{12}$	$75\frac{7}{10}$	75.7	8 ft. 7 in.
$42\frac{1}{2}$	$41\frac{5}{10}$	41.5	4 ft. 6 in.

(e) Find the sum of fifty-four and five tenths, and seventy-two and six tenths.

Slate Work in Subtraction.

(a)	(b)	(c)	(d)
86	94	94	16 ft.
$23\frac{5}{12}$	$21\frac{3}{10}$	21.3	5 ft. 5 in.

(e) Find the difference of seventy-four, and forty-two and four tenths.

Slate Work in Multiplication.

(a)	(b)	(c)	(d)
$42\frac{5}{12}$	$63\frac{7}{10}$	63.7	8 ft. 4 in.
3	2	2	4

(e) Find the product of fifty-one and five tenths multiplied by three.

Slate Work in Division.*

(a)	(b)	(c)
\$5)\$45	5 tenths)45 tenths	.5)4.5
(d)	(e)	(f)
5)\$45	5)45 tenths	5)4.5
(g)	(h)	(i)
2)438	2)439	$2)438\frac{1}{2}$

* See foot-note, page 110.

Five number facts to be memorized.

5 sevens are 35. 4 nines are 36.
7 fives are 35. 9 fours are 36.
6 sixes are 36.

1. Thirty-six pecks are —— bushels.
2. Thirty-five days are —— weeks.
3. Thirty-six spoons are —— sets.
4. Thirty-five fifths are —— wholes.
5. Thirty-six ninths are —— wholes.

6. 36 is —— 7's and ——. 36 is —— 8's and ——.
7. 37 is —— 9's and ——. 38 is —— 6's and ——.
8. 39 is —— 4's and ——. 40 is —— 6's and ——.

9. 9 gallons are —— quarts. 8 gallons =
10. 5 weeks are —— days. 4 weeks =

11. Thirty-seven inches are —— feet and ——.
12. Thirty-eight days are —— weeks and ——.
13. Thirty-nine quarts are —— gallons and ——.

14. Five weeks and 2 days are —— days.
15. Three feet and 3 inches are —— inches.
16. Nine bushels and 1 peck are —— pecks.

17. $2\frac{2}{3}$ are —— thirds. $3\frac{2}{3}$ are —— thirds.
18. $2\frac{3}{4}$ are —— fourths. $3\frac{3}{4}$ are —— fourths.
19. $2\frac{4}{5}$ are —— fifths. $3\frac{4}{5}$ are —— fifths.
20. $2\frac{3}{5}$ are —— fifths. $3\frac{3}{5}$ are —— fifths.
21. $4\frac{1}{3}$ are —— thirds. $4\frac{2}{3}$ are —— thirds.
22. $4\frac{1}{4}$ are —— fourths. $4\frac{3}{4}$ are —— fourths.

Read first by column, then by line.

4 2's are ——. 4 5's are ——. 4 8's are ——.
4 3's are ——. 4 6's are ——. 4 9's are ——.
4 4's are ——. 4 7's are ——. 4 10's are ——.

1. Add 6 bu., 4 bu., 2 bu., and 1 bu.*
(a) Add 344 bu., 46 bu., and 35 bu.†

2. From 19 bushels subtract 6 bushels.
(b) From 472 bushels subtract 146 bushels.

3. Multiply 9 bushels by 4.
(c) Multiply 292 bushels by 3.

4. Divide 35 bushels by 5 bushels.
(d) Divide 525 bushels by 5 bushels.

5. Divide 35 bushels by 5.
(e) Divide 525 bushels by 5.

6. At $3 a barrel, 8 barrels of apples cost ———.
(f) At $236 an acre, 2 acres of land cost ———.

7. Two thirds of 12 dollars are —— dollars.
(g) Two thirds of 99 dollars are —— dollars.
(h) Two thirds of 96 dollars are —— dollars.

8. Twelve dollars are $\frac{2}{3}$ of —— dollars.
(i) Forty-four dollars are $\frac{2}{3}$ of —— dollars.
(j) Forty-six dollars are $\frac{2}{3}$ of —— dollars.

9. A lady bought 8 yards of lace at $2 a yard; she gave the salesman two ten-dollar bills; she should receive in change —— dollars.

10. A man paid 5 hundred dollars for a house; he paid 1 hundred dollars for repairing it; he sold the house for 8 hundred dollars; he gained —— hundred dollars.

11. Mary bought 5¢ worth of pens, 10¢ worth of paper and 3¢ worth of gum; if she gave the salesman a quarter of a dollar, how much change should she receive?

* Teach the abbreviation *bu.* for bushel or bushels.

† Problems designated by *letters* are for the slate.

1. Think of an oblong 5 inches by 7 inches. Think of it divided into 1-inch squares. The area of the oblong is ——— ——— square inches. 7 square inches × 5 = 5 square inches × 7 =

2. The perimeter of an oblong 5 inches by 7 inches is ——— inches. 7 in. + 7 in. + 5 in. + 5 in.=

3. The first day of September, 1895, was Sunday; the second Sunday was the ——— th; the third Sunday was the ———; the fourth Sunday was the ———; the fifth Sunday was the ———.

4. The first Sunday of August, 1895, was the fourth day of the month; the second Sunday was the ——— th; the third Sunday was the ——— th; the fourth Sunday was the ——— th. 4, 11, 18, 25.

5. The Saturdays of August, 1895, were the 3d, ———, ———, ———, and ———.

6. The Fridays of August, 1895, were the 2d, ——— ———, ———, and ———.

7. Seven 5-cent stamps cost ——— cents.

8. A passenger train runs from Waukegan to Lake Forest in 15 minutes. If the train leaves Waukegan at 9:50 it should reach Lake Forest at ———.

9. At 6¢ a quart, 6 quarts of milk cost ——— cents; 6½ quarts cost ——— cents.

10. Peter rode 36 miles in 4 hours; he rode at the rate of ———miles per hour. 36 ÷ 4 =

11. Paul rode 37 miles in 4 hours; he rode at the rate of ——— miles per hour. 37 ÷ 4 =

12. Saul rode 38 miles in 4 hours; he rode at the rate of ——— miles an hour. 38 ÷ 4 =

Thirty days hath September,
April, June, and November.

Each of the other months has 31 days except February. February has 29 days in a leap year and 28 days in all other years.

This Year.

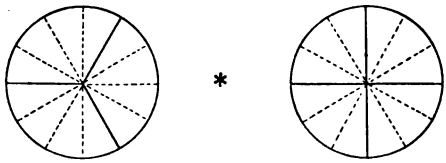
1. In January there are —— weeks and —— days.
2. In February there are —— weeks and —— day.
3. In March there are —— weeks and —— days.
4. In April there are —— weeks and —— days.
5. In May there are —— weeks and —— days.
6. In June there are —— weeks and —— days.
7. In July there are —— weeks and —— days.
8. In August there are —— weeks and —— days.
9. In September there are —— weeks and —— days.
10. In October there are —— weeks and —— days.
11. In November there are —— weeks and —— days.
12. In December there are —— weeks and —— days.

Can you read the 12 statements given above, filling each blank correctly, in 40 seconds? Can you do it if they are put upon the blackboard in some other order? Try it.

Slate Work in Addition.

(a)	(b)	(c)	(d)	(e)
274	465	342	594	632
361	182	286	143	296

(f)	(g)	(h)	(i)	(j)
195	375	464	555	576
242	283	384	284	143



1. One third is —— twelfths.
2. One fourth is —— twelfths.
3. Two thirds are —— twelfths.
4. Three fourths are —— twelfths.
5. Add 1 fourth and 1 third.

1 fourth is —— twelfths.
1 third is —— twelfths.
—— twelfths and —— twelfths are —— twelfths.

6. Add 2 thirds and 1 fourth.

2 thirds are —— twelfths.
1 fourth is —— twelfths.
—— twelfths and —— twelfths are —— twelfths.

7. From 3 fourths subtract 1 third.

3 fourths are —— twelfths.
1 third is —— twelfths.
—— twelfths less —— twelfths are —— twelfths.

8. One fourth of a foot and 1 third of a foot are —— twelfths of a foot.

9. Three fourths of a foot and 1 third of a foot are _____.

10. Three fourths of a foot less 1 third of a foot are _____.

11. Three fourths of a foot and 2 thirds of a foot are _____.

* Using blackboard diagrams, do much oral work similar to that upon this page, before the pupil is asked to read the page.

[illegible]

[illegible]

[illegible]	[illegible] =	[illegible] =
[illegible]	[illegible] =	[illegible] =
[illegible]		[illegible] =
[illegible]		[illegible] =
[illegible]	[illegible] =	[illegible] =
[illegible]		[illegible] =

[illegible] line $2\frac{1}{4}$ feet [illegible] feet long.

[illegible] feet; the [illegible] feet long [illegible] $4 - 1\frac{1}{2} =$ [illegible] was [illegible] feet [illegible] The perimeter [illegible] feet [illegible] $4 =$ [illegible] feet long. He [illegible] was [illegible] of a foot long. [illegible]

[illegible] feet long. He [illegible] was [illegible]

[illegible]	[illegible] =	[illegible] feet $- 2 =$
[illegible]	[illegible] =	[illegible] feet $- 2 =$
[illegible]	[illegible] =	[illegible] of a foot $\div 2 =$
[illegible]	[illegible] =	[illegible] of a foot $\div 2 =$
[illegible]	[illegible] of a foot =	$\frac{1}{4}$ of a foot $\div 2 =$
17.	3 feet $- \frac{1}{3}$ of a foot =	$\frac{1}{3}$ of a foot $\div 3 =$
18.	3 feet $+ \frac{1}{4}$ of a foot =	$\frac{1}{3}$ of a foot $\div 4 =$

* This means 6 times $\frac{1}{3}$ plus $\frac{1}{2}$ of $\frac{1}{3}$.

Four number facts to be memorized.
12 eights are 96. 11 eights are 88.
8 twelves are 96. 8 elevens are 88.

1. Can you add column (a) in fifteen seconds, beginning at the top?

2. Can you add column (a) in fifteen seconds, beginning at the bottom?

3. Practice until you can do this with each column.

4. Ten eights are ——.

5. Eleven eights are ——.

6. Twelve eights are ——.

7. Twenty eights are ——.

8. 27 + 8 = 17 + 8 =

9. 37 + 8 = 57 + 8 =

10. 46 + 8 = 16 + 8 =

11. 26 + 8 = 56 + 8 =

12. 38 + 8 = 18 + 8 =

13. 48 + 8 = 28 + 8 =

14. 25 + 8 = 15 + 8 =

15. 65 + 8 = 55 + 8 =

(a)	(b)	(c)	(d)	(e)	(f)
8	2	4	6	8	8
8	8	8	8	8	2
8	8	8	8	7	7
8	8	8	8	8	6
8	8	8	8	8	3
8	8	8	8	6	5
8	8	8	8	8	1
8	8	8	8	8	4
8	8	8	8	5	8
8	8	8	8	8	6
8	8	8	8	8	2
8	8	8	8	4	7
8	8	8	8	8	3
1	3	5	7	3	4
					5
					2
					1
					8
					2
					6
					7
					5

58 + 8 =

78 + 8 =

35 + 8 =

75 + 8 =

Read, and give sums.

29	46	19	34	24	45
8	8	8	8	8	8
14	54	23	43	13	36
8	8	8	8	8	8
22	42	12	62	32	47
8	8	8	8	8	8

1. 6 is contained in 13 —— times and —— over.
2. 6 is contained in 13 —— and —— —— times.
3. 6 is contained in 14 —— times and —— over.
4. 6 is contained in 14 —— and —— —— times.
5. 6 is contained in 15 —— times and —— over.
6. 6 is contained in 15 —— and —— —— times.
7. 6 is contained in 16 —— times and —— over.
8. 6 is contained in 16 —— and —— —— times.
9. 6 is contained in 17 —— times and —— over.
10. 6 is contained in 17 —— and —— —— times.
11. 6 is contained in 25 —— and —— —— times.
12. 6 is contained in 20 —— and —— —— times.
13. 6 is contained in 34 —— and —— —— times.
14. 6 is contained in 39 —— and —— —— times.
15. 6 is contained in 43 —— and —— —— times.

16. When milk costs 6¢ a quart, for 27¢ I can buy —— and —— —— quarts. 27¢ ÷ 6¢ =

17. If books cost 6¢ each, with 27¢ I can buy —— books and have —— cents left. 27¢ ÷ 6¢ =

18. When milk costs 6¢ a quart, for 33¢ I can buy —— and —— —— quarts. 33¢ ÷ 6¢ =

19. If books cost 6¢ each, with 33¢ I can buy —— books and have —— cents left. 33¢ ÷ 6¢ =

Slate Work in Subtraction.

(a)	(b)	(c)	(d)	(e)
376	628	734	934	862
182	275	351	682	481

(f)	(g)	(h)	(i)	(j)
$844\frac{1}{2}$	$563\frac{1}{3}$	875	956	743
272	381	$482\frac{1}{2}$	$263\frac{1}{3}$	$261\frac{1}{4}$

1.	3 bu. 2 pk. + 4 bu. 1 pk. = *	$3\frac{1}{2} + 4\frac{1}{4} =$
2.	4 bu. 3 pk. − 2 bu. 2 pk. =	$4\frac{3}{4} - 2\frac{1}{2} =$
3.	5 bu. 1 pk. × 3 =	$5\frac{1}{4} \times 3 =$
4.	2 bu. 2 pk. × $2\frac{1}{2}$ = †	$2\frac{1}{2} \times 2\frac{1}{2} =$
5.	2 bu. 2 pk. ÷ 2 pk. =	$2\frac{1}{2} \div \frac{1}{2} =$
6.	2 pk. ÷ 4 =	$\frac{1}{2} \div 4 =$
7.	\$2.4 + \$3.1 =	$2\frac{2}{5} + 3\frac{1}{10} =$
8.	\$6.8 − \$3.1 =	$6\frac{4}{5} - 3\frac{1}{10} =$
9.	\$5.2 × 4 =	$5\frac{1}{5} \times 4 =$
10.	\$4.2 × $2\frac{1}{2}$ = ‡	$4\frac{1}{5} \times 2\frac{1}{2} =$ ‡
11.	\$3.6 ÷ \$.6 = ‡	$3\frac{3}{5} \div \frac{3}{5} =$ ‡
12.	\$3.6 ÷ 3 = ‡	$3\frac{3}{5} \div 3 =$ ‡

Review page 104.

13. The long hand of a clock moves from X to XII in —— minutes; from VI to X in —— minutes.

14. The short hand of a clock moves from IX to XI in —— ——; from IV to VIII in —— ——.

15. The best trains go from Waukegan to Chicago in 50 minutes; such a train leaving Waukegan at 10:30 should arrive in Chicago at ——.

16. A train from Aurora was due in Chicago at 2:15; it arrived at 2:45; it was —— minutes late.

17. From 1:30 to 2:45 it is —— hour and —— minutes.

18. From 9:10 to 10:40 it is —— hour and —— minutes.

19. From 4:00 to 6:15 it is —— hours and —— minutes.

* Teach the abbreviation *pk.* for peck or pecks.

† If the pupil clearly understands that this means 2 times 2 bu. 2 pk. plus ½ of 2 bu. 2 pk., he will have no difficulty with the problem.—Number story: My grain bags hold 2 bu. 2 pks. each; I have $2\frac{1}{2}$ bags of oats; I have —— bu. —— pk. of oats.

‡ What does the expression mean? See pages 89 and 114.

Slate Work in Addition.

(a)	(b)	(c)	(d)
$96\frac{1}{8}$	$85\frac{8}{10}$	85.8	6 bu. 3 pk.
$22\frac{1}{4}$	$32\frac{5}{10}$	32.5	7 bu. 3 pk.

(e) Find the sum of eighteen bushels two pecks and twenty-six bushels three pecks.

Slate Work in Subtraction.

(a)	(b)	(c)	(d)
$86\frac{1}{8}$	$95\frac{1}{10}$	95.1	8 bu. 1 pk.
$22\frac{5}{8}$	$35\frac{5}{10}$	31.5	2 bu. 3 pk.

(e) Find the difference of sixteen bushels one peck and ten bushels three pecks.

Slate Work in Multiplication.

(a)	(b)	(c)	(d)
$31\frac{5}{8}$	$41\frac{7}{10}$	41.7	12 bu. 2 pk.
5	5	5	5

(e) Find the product of twenty-three bushels two pecks multiplied by five.

Slate Work in Division.*

(a)	(b)	(c)
\$5)\$275	5 tenths)275 tenths.	.5)27.5
(d)	(e)	(f)
5)\$275	5)275 tenths.	5)27.5
(g)	(h)	(i)
3)936	3)937	$3)936\frac{1}{2}$

* See foot-note, page 110.

Six number facts to be memorized.

5 eights are 40. 6 sevens are 42.
8 fives are 40. 7 sixes are 42.
5 nines are 45. 9 fives are 45.

1. Forty quarts are —— pecks.
2. Forty-two days are —— weeks.
3. Forty-two spoons are —— sets.
4. Forty-five ninths are —— wholes.

5. 41 is —— 8's and ——. 42 is —— 5's and ——.
6. 43 is —— 8's and ——. 44 is —— 6's and ——.
7. 45 is —— 7's and ——. 46 is —— 9's and ——.
8. 47 is —— 5's and ——. 48 is —— 9's and ——.

9. 10 gallons are —— quarts. 9 gallons =
10. 6 weeks are —— days. 5 weeks =

11. Forty inches are —— feet and —— inches.
12. Forty-five days are —— weeks and —— days.
13. Forty-six quarts are —— gallons and —— quarts.

14. Six weeks and 4 days are —— days.
15. Three feet and 7 inches are —— inches.
16. Eleven bushels and 1 peck are —— pecks.

17. $2\frac{1}{6}$ are —— sixths. $3\frac{1}{6}$ are —— sixths.
18. $4\frac{1}{6}$ are —— sixths. $5\frac{1}{6}$ are —— sixths.

19. 22 thirds are ——. 22 fourths are ——.
20. 22 fifths are ——. 22 sixths are ——.
21. 24 fifths are ——. 25 sixths are ——.
22. 25 thirds are ——. 25 fourths are ——.

Read first by column, then by line.

5 2's are ——. 5 5's are ——. 5 8's are ——.
5 3's are ——. 5 6's are ——. 5 9's are ——.
5 4's are ——. 5 7's are ——. 5 10's are ——.

1. Add 2 ft. 10 in. and 4 ft. 5 in.

(a) Add 146 feet 10 in. and 83 ft. 6 in.*

2. From 16 subtract the sum of 4 and 8.

(b) From 256 subtract the sum of 47 and 38.

3. Multiply 2 ft. 3 in. by 5.

(c) Multiply 53 ft. 4 in. by 5.

4. Divide 42 feet by 6 feet.

(d) Divide 444 feet by 6 feet.

5. Divide 42 feet by 6.

(e) Divide 444 feet by 6.

6. At $5 a ton, 9 tons of coal cost ————.

(f) At $125 each, 3 horses cost ————.

7. Three fourths of 12 dollars are —— dollars.

(g) Three fourths of 120 dollars are —— dollars.

8. Twelve dollars are $\frac{3}{4}$ of —— dollars.

(h) One hundred and twenty dollars are $\frac{3}{4}$ of —— dollars.

(i) Three hundred and sixty dollars are $\frac{3}{4}$ of —— dollars.

9. A lady bought 9 curtains at $5 each; she gave the salesman 5 ten-dollar bills; she should receive in change —— ——.

(j) A gentleman bought 4 horses at $120 each; he gave in payment 5 one hundred dollar bills; he should receive in change —— dollars.

10. A man paid 6 hundred dollars for a piece of land; he spent 1 hundred dollars in improving it, and sold it for 9 hundred dollars; he gained —— hundred dollars.

(k) A man paid 614 dollars for a piece of land; he spent 136 dollars in improving it, and sold it for 975 dollars; he gained —— ——.

* Problems designated by *letters* are for the slate.

1. Think of an oblong 3 feet by 10 feet. Think of it divided into 1-foot squares. The area of the oblong is —— square feet. 10 sq. feet × 3 = 3 sq. ft. × 10 =

2. The perimeter of an oblong 3 feet by 10 feet is —— feet.. 10 ft. + 10 ft. + 3 ft. + 3 ft. =

3. Think of a floor 6 ft. by 7 ft. Think of it divided into 1-foot squares. The area of a floor 6 ft. by 7 ft. is —— square feet. 7 sq. ft. × 6 = 6 sq. ft. × 7 =

4. The perimeter of a floor 6 ft. by 7 ft. is —— feet. 6 ft. + 6 ft. + 7 ft. + 7 ft. =

5. Think of a piece of sidewalk 4 ft. wide and 20 ft. long. The area of the walk is —— square feet. It is made of tiles, each tile being 1 foot square. Can you tell how many tiles there are? 4 tiles × 20 = 20 tiles × 4 =

6. The first day of October, 1895, was Tuesday; the second Tuesday of October was the ——th day of the month; the third Tuesday was the ——th; the fourth Tuesday was the ——; the fifth Tuesday was the ——.

7. The Mondays of September, 1895, were the 2nd, ——, ——, ——, and ——.

8. At 20¢ a peck, 3 pecks of apples cost —— cents; 8½ pecks cost ————; 1 bushel costs ————.

9. Harry rode 45 miles in 5 hours; he rode at the rate of —— miles an hour. 45 ÷ 5 =

10. James rode 46 miles in 5 hours; he rode at the rate of —— miles an hour. 46 ÷ 5 =

11. Richard rode 48 miles in 5 hours; he rode at the rate of —— miles an hour. 48 ÷ 5 =

12. Nine 5-cent stamps cost —— cents.

13. Twelve 3-cent stamps cost —— cents.

14. Fifteen 3-cent stamps cost —— cents.

1. *What day of the week is it? To-day is ————. Two weeks from to-day will be ————. Four weeks from to-day will be ————. Four weeks and 1 day from to-day will be ————. Twenty-nine days from to-day will be ————. Thirty days from to-day will be ————. Four weeks and three days from to-day will be ————. Thirty-one days from to-day will be ————.

2. From January 1st to February 1st it is ——— days.
From February 1st to March 1st it is ——— days.
From March 1st to April 1st it is ——— days.
From April 1st to May 1st it is ——— days.
From May 1st to June 1st it is ——— days.
From June 1st to July 1st it is ——— days.

3. The year 1896 was a leap year. February, 1896, had ——— days.

4. January 1st, 1896, was Wednesday; February 1st, 1896, was ————.

5. August 1st, 1896, was Saturday; September 1st, 1896, was ————.

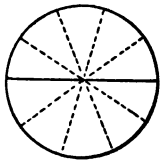
6. February 1st, 1896, was Saturday; March 1st, 1896, was ————.

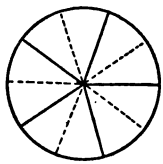
7. September 1st, 1896, was Tuesday; October 1st, 1896, was ————

Slate Work in Multiplication.

(a)	(b)	(c)	(d)
242	142	$462\frac{1}{2}$	$462\frac{1}{2}$
$3\frac{1}{2}$	$4\frac{1}{2}$	2	3

*Do much oral work similar to what appears upon this page before asking the pupil to read the page. Select the work from the current year. Be sure that the pupil sees clearly that the first day of February will be 3 days later in the week than the first day of January; the first day of July, 2 days later in the week than the first day of June. This work will be found to be of great practical value. See Table of Contents, page 40, under *Date problems*.





1. One half is —— tenths.
2. One fifth is —— tenths.
3. Three fifths are —— tenths.
4. Two fifths are —— tenths.
5. Four fifths are —— tenths.

6. Add 1 half and 1 fifth.

1 half is —— tenths.
1 fifth is —— tenths.
—— tenths and —— tenths are —— tenths.

7. Add two fifths and 1 half.

2 fifths are —— tenths.
1 half is —— tenths.
—— tenths and —— tenths are —— tenths.

8. From 4 fifths subtract 1 half.

4 fifths are —— tenths.
1 half is —— tenths.
—— tenths less —— tenths are —— tenths.

2 dimes are one fifth of a dollar.
5 dimes are one half of a dollar.

9. One fifth of a dollar and 1 half of a dollar are —— tenths of a dollar.

10. Four fifths of a dollar less 1 half of a dollar are —— tenths of a dollar.

* See foot note, page 125.

Review page 106.

1. $\frac{1}{2}$ of an inch + $\frac{1}{8}$ of an inch = $\frac{1}{2} + \frac{1}{8} =$
2. $\frac{1}{2}$ of an inch − $\frac{1}{8}$ of an inch = $\frac{1}{2} - \frac{1}{8} =$
3. $\frac{1}{8}$ of an inch × 2 = $\frac{1}{8} \times 2 =$
4. $\frac{1}{8}$ of an inch × $2\frac{1}{2}$ = * $\frac{1}{8} \times 2\frac{1}{2} =$ *
5. 5 inches ÷ $\frac{1}{2}$ of an inch = $5 \div \frac{1}{2} =$
6. $\frac{1}{2}$ of an inch ÷ 5 = $\frac{1}{2} \div 5 =$

7. Draw a line $3\frac{1}{2}$ inches long; erase from it $2\frac{1}{8}$ inches; the line that is left is —— and —— —— inches long. $3\frac{1}{2} - 2\frac{1}{8} =$

8. Draw a line $3\frac{1}{2}$ inches long; erase from it $1\frac{1}{8}$ inches; the line that is left is —— and —— —— inches long. $3\frac{1}{2} - 1\frac{1}{8} =$

9. Harry drew an oblong; it was $1\frac{1}{8}$ inches wide and $1\frac{1}{2}$ inches long; its perimeter was —— and —— —— inches. $1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{8} + 1\frac{1}{8}$.

10. Arthur had a piece of silver wire; it was $1\frac{1}{2}$ inches long; he wished to divide into pieces $\frac{1}{8}$ of an inch long; he could make —— such pieces and have —— —— of an inch left.

11. James had a piece of copper wire; it was 1.5 inches long; he divided it into three equal pieces; each piece was —— long.

1.6 inches ÷ .4 of an inch = 1.6 inches ÷ 4 =

1.8 inches ÷ .6 of an inch = 1.8 inches ÷ 6 =

2.5 inches ÷ .5 of an inch = 2.5 inches ÷ 5 =

* This means 2 times $\frac{1}{8}$ plus $\frac{1}{2}$ of $\frac{1}{8}$.

Four number facts to be memorized.

12 nines are 108. 11 nines are 99.
9 twelves are 108. 9 elevens are 99.

1. Can you add column (a) in fifteen seconds, beginning at the top?

2. Can you add column (a) in fifteen seconds, beginning at the bottom?

3. Practice until you can do this with each column.

4. Ten nines are ——.

5. Eleven nines are ——.

6. Twelve nines are ——.

7. Twenty nines are ——.

(a)	(b)	(c)	(d)	(e)	(f)	(g)
9	2	4	6	8	9	9
9	9	9	9	9	9	6
9	9	9	9	9	9	9
9	9	9	9	9	1	7
9	9	9	9	9	9	9
9	9	9	9	9	9	8
9	9	9	9	9	9	9
9	9	9	9	9	2	1
9	9	9	9	9	9	9
9	9	9	9	9	9	2
9	9	9	9	9	9	9
9	9	9	9	9	3	3
1	3	5	7	9	9	9
					9	4
					9	9
					4	5
					9	9
					9	6
					5	9

8. $27 + 9 =$ $17 + 9 =$
9. $37 + 9 =$ $57 + 9 =$
10. $46 + 9 =$ $16 + 9 =$ $85 + 9 =$
11. $26 + 9 =$ $56 + 9 =$ $73 + 9 =$
12. $38 + 9 =$ $18 + 9 =$ $47 + 9 =$
13. $48 + 9 =$ $28 + 9 =$ $64 + 9 =$
14. $25 + 9 =$ $15 + 9 =$ $35 + 9 =$
15. $65 + 9 =$ $45 + 9 =$ $75 + 9 =$

Read, and give sums.

29	48	19	34	24	36
9	9	9	9	9	9
14	54	23	43	13	51
9	9	9	9	9	9
22	42	12	61	31	32
9	9	9	9	9	9

1. 7 is contained in 15 —— times and —— over.
2. 7 is contained in 15 —— and —— —— times.

3. 7 is contained in 16 —— times and —— over.
4. 7 is contained in 16 —— and —— —— times.

5. 7 is contained in 18 —— times and —— over.
6. 7 is contained in 18 —— and —— —— times.

7. 7 is contained in 23 —— times and —— over.
8. 7 is contained in 23 —— and —— —— times.

9. 7 is contained in 30 —— times and —— over.
10. 7 is contained in 30 —— and —— —— times.

11. 7 is contained in 38 —— and —— —— times.
12. 7 is contained in 43 —— and —— —— times.

13. 7 is contained in 45 —— and —— —— times.
14. 7 is contained in 40 —— and —— —— times.
15. 7 is contained in 50 —— and —— —— times.

16. When milk is 7¢ a quart, for 18¢ I can buy —— and —— —— quarts. 18¢ ÷ 7¢ =

17. If books cost 7¢ each, with 18¢ I can buy —— books and have —— cents left. 18¢ ÷ 7¢ =

Slate Work in Division.*

(a)	(b)	(c)	(d)
4)20	4)420	4)820	4)821
(e)	(f)	(g)	(h)
4)24	4)424	4)826	4)427
(i)	(j)	(k)	(l)
4)32	4)432	4)833	4)834

* Observe the double nature of these problems. 4)20 means find how many times 4 is contained in 20, or it may mean find ¼ of 20.

1. 3 ft. 6 in. + 3 ft. 7 in. =	$3\frac{1}{2} + 3\frac{7}{12} =$
2. 3 ft. 6 in. − 1 ft. 4 in. =	$3\frac{1}{2} - 1\frac{1}{3} =$ *
3. 4 ft. 8 in. × 4 =	$4\frac{2}{3} \times 4 =$
4. 4 ft. 8 in. × $4\frac{1}{2}$ = *	$4\frac{2}{3} \times 4\frac{1}{2} =$ *
5. 4 ft. 6 in. ÷ 6 in. = *	$4\frac{1}{2} \div \frac{1}{3} =$ *
6. 4 ft. 6 in. ÷ 2 = *	$4\frac{1}{2} \div 2 =$ *

Review pages 104, 119, 129.

7. The letters A.M. stand for the words *ante meridiem*. These words mean *before noon*.

8. The letters P.M. stand for the words *post meridiem*. These words mean *after noon*.

9. From 10 o'clock A.M. to 2 o'clock P.M. it is —— hours.

10. From 9 o'clock P.M. to 4 o'clock A.M. it is —— hours.

11. From 4:30 P.M. to 6:30 P.M. it is ————.

12. From 9:30 P.M. to 1:30 A.M. it is ————.

13. Mr. Smith begins work at 7 o'clock A.M., he has one hour for dinner and rest at noon, and then works until 6 o'clock P.M. Each day he works —— hours.

14. A train from Chicago was due in Waukegan at 10:45; it arrived at 11:10; it was —— minutes late.

15. A train moved 30 miles in 1 hour; this was at the rate of 1 mile in —— minutes.

16. A train moved 10 miles in 15 minutes; this was at the rate of —— miles an hour.

18. A train moved at the rate of 40 miles an hour for 2 hours and 30 minutes; it moved —— miles.

* What does the expression mean?

Slate Work in Addition.

(a)	(b)	(c)	(d)
$87\frac{3}{4}$	$83\frac{1}{2}$	83.5	3 h. 30 min.
$82\frac{1}{8}$	$64\frac{3}{8}$	64.6	5 h. 40 min.

(e) Find the sum of eleven hours thirty minutes and twelve hours thirty minutes..

Slate Work in Subtraction.

(a)	(b)	(c)	(d)
$79\frac{1}{6}$	83	83.5	24 h.
$34\frac{5}{6}$	27	27.2	12 h. 20 min.

(e) Find the difference of twenty-three hours and five hours forty minutes.

Slate Work in Multiplication.

(a)	(b)	(c)	(d)
$44\frac{1}{12}$	$56\frac{1}{10}$	57.1	3 h. 10 min.
5	5	5	5

(e) Find the product of six hours twenty minutes multiplied by five.

Slate Work in Division.

(a)	(b)	(c)
\$6)\$324	6 tenths)324 tenths.	.6)32.4
(d)	(e)	(f)
6)\$324	6)324 tenths.	6)32.4
(g)	(h)	(i)
4)433	4)435	$4)432\frac{1}{2}$

* Teach the abbreviation *h.* for hour or hours.

Seven number facts to be memorized.

6 eights are 48. 6 nines are 54.
8 sixes are 48. 9 sixes are 54.
7 eights are 56. 8 sevens are 56.
7 sevens are 49.

1. Forty-eight quarts are —— pecks.
2. Forty-nine days are —— weeks.
3. Fifty-four spoons are —— sets.
4. Fifty-six days are —— weeks.

5. 49 is —— 8's and ——. 50 is —— 7's and ——.
6. 51 is —— 6's and ——. 52 is —— 7's and ——.
7. 53 is —— 6's and ——. 54 is —— 8's and ——.
8. 55 is —— 9's and ——. 56 is —— 6's and ——.

9. 7 pecks are —— quarts. 6 pecks =
10. 8 weeks are —— days. 7 weeks =

11. Fifty inches are —— feet and —— inches.
12. Fifty days are —— weeks and —— day.
13. Fifty quarts are —— pecks and —— quarts.

14. Seven weeks and 3 days are —— days.
15. Four feet and 5 inches are —— inches.
16. Twelve bushels and 3 pecks are —— pecks.

17. $2\frac{3}{7}$ are —— sevenths. $3\frac{4}{7}$ are —— sevenths.
18. $4\frac{1}{7}$ are —— sevenths. $5\frac{2}{7}$ are —— sevenths.

19. 25 fourths are ——. 25 fifths are ——.
20. 25 sixths are ——. 25 sevenths are ——.
21. 34 fourths are ——. 34 fifths are ——.
22. 34 sixths are ——. 34 sevenths are ——.

Read first by column, then by line.

6 2's are ——. 6 5's are ——. 6 8's are ——.
6 3's are ——. 6 6's are ——. 6 9's are ——.
6 4's are ——. 6 7's are ——. 6 10's are ——.

1. Add 5 gal. 2 qt. and 5 gal. 3 qt.*

(a) Add 124 gal. 2 qt. and 31 gal. 3 qt. †

2. From the sum of 9 and 5, subtract 10.

(b) From the sum of 236 and 72, subtract 104.

3. Multiply 6 by 3 and to the product add 6.‡

(c) Multiply 125 by 3 and to the product add 125.

4. Divide 12 by 2 and multiply the quotient by 3.

(d) Divide 256 by 2 and multiply the quotient by 3.

5. At $3 a barrel, 9 barrels of apples cost ——.

(e) At $171 an acre, 4 acres of land cost ————.

6. Two thirds of 18 inches are —— inches.

(f) Two thirds of 126 inches are —— inches.

7. Eighteen inches are $\frac{2}{3}$ of —— inches.

(g) One hundred and twenty-six inches are $\frac{2}{3}$ of —— inches.

8. A man paid 8 hundred dollars for a house; he repaired it at a cost of 4 hundred dollars, and sold it for 10 hundred dollars; he lost —— hundred dollars.

(h) A man paid 836 dollars for a house; he repaired it at a cost of 124 dollars and sold it for 925 dollars; he lost ————.

9. Two thirds of 6 are one half of ——. §

10. One half of 12 is two thirds of ——.

11. Two thirds of 12 are one half of ——.

12. One half of 16 is two thirds of ——.

13. Two thirds of 15 are one half of ——.

14. One half of 20 is two thirds of ——.

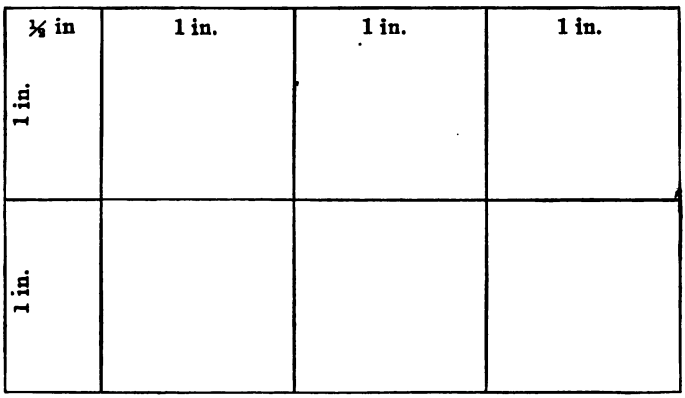
* Teach the abbreviation, *gal.* for gallon or gallons.

† Problems designated by *letters* are for the slate.

‡ Lead the pupil to see that the same result might have been obtained by multiplying 6 by 4.

§ If the pupil has trouble with this problem, require him to stop after he says, "Two thirds of six," until he can think how many $\frac{1}{3}$ of 6 are.

1. Observe the diagram given below. It is an oblong 2 inches by $3\frac{1}{2}$ inches. Think of it as made up of two rows of 1-inch squares with a piece of another square at one end of each row. The piece is —— —— of a square inch. In each row there are —— and —— —— square inches. $3\frac{1}{2}$ sq. in. × 2 = ——. The area of an oblong 2 inches by $3\frac{1}{2}$ inches is ——————.



2. Draw an oblong $4\frac{1}{2}$ inches by 2 inches. Divide it as far as possible, into 1-inch squares. It contains two rows of figures. In each row there are —— and —— ——square inches. The area of an oblong $4\frac{1}{2}$ inches by 2 inches is ————. $4\frac{1}{2}$ sq. in. × 2 =

3. Peter rode 56 miles in 7 hours; he rode at the rate of —— miles an hour.

4. Harris rode 57 miles in 7 hours; he rode at the rate of ———— miles an hour.

5. Adam rode 59 miles in 7 hours; he rode at the rate of ———— miles an hour.

1. A year that is not a leap year is sometimes called a common year. In a common year there are 365 days. 365 days ÷ 7 days = ———.* In a common year there are ——— weeks and ——— day.

2. If the first day of a common year is Monday, the first day of the next year will be ————.

3. We may think of a year as beginning at any time and ending on the same day of the same month of the next year; thus, it is a year from April 10, 1894 to April 10, 1895; it is a year from May 4, 1895 to May 4, 1896.

4. Any year in which there is a February 29th contains 366 days; all other years contain ——— days.

5. From February 10th of a leap year to February 10th of the next year it is ——— days. 366 days ÷ 7 days = *

6. If February 20th of a common year was Wednesday, February 20th of the next year would be ————.

7. If February 20th of a leap year was Wednesday, February 20th of the next year would be ————.

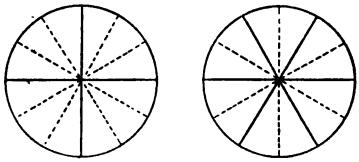
8. From March 1st of a leap year to March 1st of the next year it is ——— days. If March 1st of a leap year is Monday, March 1st of the next year would be ————.

Slate Work in Addition.

(a)	(b)	(c)	(d)	(e)	(f)
275	448	375	456	384	437
146	283	236	266	237	283

(g)	(h)	(i)	(j)	(k)	(l)
146	274	342	524	237	324
275	156	256	173	153	165
36	38	131	146	84	287

* Use a pencil.



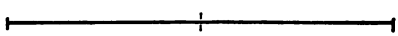
1. One fourth is —— twelfths.
2. One sixth is —— twelfths.
3. Three fourths are —— twelfths.
4. Five sixths are —— twelfths.

5. Add 1 fourth and 1 sixth.
   1 fourth is —— twelfths.
   1 sixth is —— twelfths.
   —— twelfths and —— twelfths are —— twelfths.

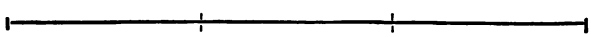
6. Add 3 fourths and 1 sixth.
   3 fourths are ——twelfths.
   1 sixth is —— twelfths.
   —— twelfths and —— twelfths are —— twelfths.

7. From 5 sixths subtract 1 fourth.
   5 sixths are —— twelfths.
   1 fourth is —— twelfths.
   —— twelfths less —— twelfths are —— twelfths.

One sixth of a foot.



One fourth of a foot.



8. One sixth of a foot and 1 fourth of a foot are —— twelfths of a foot.

9. Three fourths of a foot less 1 sixth of a foot are —— twelfths of a foot.

* See foot-note, page 125.

1. $\frac{1}{4}$ of a foot + $\frac{1}{8}$ of a foot = $\frac{1}{4} + \frac{1}{8} =$
2. $\frac{1}{4}$ of a foot − $\frac{1}{8}$ of a foot = $\frac{1}{4} - \frac{1}{8} =$
3. $\frac{1}{8}$ of a foot × 3 = $\frac{1}{8} \times 3 =$
4. $\frac{1}{8}$ of a foot × $3\frac{1}{2}$ =* $\frac{1}{8} \times 3\frac{1}{2} =$*
5. 2 feet ÷ $\frac{1}{4}$ of a foot = $2 \div \frac{1}{4} =$
6. $\frac{1}{4}$ of a foot ÷ 3 = $\frac{1}{4} \div 3 =$

7. Draw a line $4\frac{1}{2}$ feet long; draw another $2\frac{1}{8}$ feet long; together the lines are —— and —— —— feet long. $4\frac{1}{2} + 2\frac{1}{8} =$ $4\frac{1}{2} - 2\frac{1}{8} =$

8. Draw a line $4\frac{3}{4}$ feet long; erase from it $2\frac{1}{8}$ feet; the line that is left is —— and —— —— feet long. $4\frac{3}{4} - 2\frac{1}{8} =$ $4\frac{3}{4} + 2\frac{1}{8} =$

9. The perimeter of a $1\frac{1}{2}$-foot square is —— feet. $1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2} + 1\frac{1}{2} =$ $1\frac{1}{2} \times 4 =$

10. Richard had a piece of silver wire $2\frac{1}{4}$ feet long; he wished to divide it into pieces $\frac{1}{8}$ of a foot long; he could make —— such pieces and have —— —— of a foot left.

11. Ned had a piece of rope $11\frac{1}{2}$ feet long; he divided it into 2 equal parts; each part was —— and —— —— feet long. $11\frac{1}{2} \div 2 =$† $\frac{1}{2}$ of $11\frac{1}{2} =$

12. 12 ft. ÷ 2 = 13 ft. ÷ 2 = $13\frac{1}{2}$ ft. ÷ 2 =
13. 14 ft. ÷ 2 = 15 ft. ÷ 2 = $15\frac{1}{2}$ ft. ÷ 2 =
14. 12 ft. ÷ 3 = 13 ft. ÷ 3 = $13\frac{1}{2}$ ft. ÷ 3 = ‡
15. 15 ft. ÷ 3 = 16 ft. ÷ 3 = $16\frac{1}{2}$ ft. ÷ 3 =
16. 18 ft. ÷ 3 = 19 ft. ÷ 3 = $19\frac{1}{2}$ ft. ÷ 3 =

* This means 3 times $\frac{1}{8}$ plus $\frac{1}{2}$ of $\frac{1}{8}$.
† Find half of 11 and half of a half.
‡ Find $\frac{1}{3}$ of 13 and $\frac{1}{3}$ of $\frac{1}{3}$.

Review.

1.	$\frac{1}{2} + \frac{1}{4} =$	$\frac{1}{2} - \frac{1}{4} =$	$\frac{1}{2} \times 4 =$
2.	$\frac{1}{2} + \frac{1}{6} =$	$\frac{1}{2} - \frac{1}{6} =$	$\frac{1}{2} \times 5 =$
3.	$\frac{1}{2} + \frac{1}{8} =$	$\frac{1}{2} - \frac{1}{8} =$	$\frac{1}{2} \times 3 =$
4.	$\frac{1}{2} + \frac{1}{10} =$	$\frac{1}{2} - \frac{1}{10} =$	$\frac{1}{2} \times 6 =$
5.	$\frac{1}{2} + \frac{1}{12} =$	$\frac{1}{2} - \frac{1}{12} =$	$\frac{1}{2} \times 7 =$
6.	$\frac{1}{3} + \frac{1}{6} =$	$\frac{1}{3} - \frac{1}{6} =$	$\frac{1}{3} \times 6 =$
7.	$\frac{1}{3} + \frac{1}{9} =$	$\frac{1}{3} - \frac{1}{9} =$	$\frac{1}{3} \times 4 =$
8.	$\frac{1}{3} + \frac{1}{12} =$	$\frac{1}{3} - \frac{1}{12} =$	$\frac{1}{3} \times 5 =$
9.	$\frac{1}{4} + \frac{1}{8} =$	$\frac{1}{4} - \frac{1}{8} =$	$\frac{1}{4} \times 8 =$
10.	$\frac{1}{4} + \frac{1}{12} =$	$\frac{1}{4} - \frac{1}{12} =$	$\frac{1}{4} \times 5 =$
11.	$\frac{1}{5} + \frac{1}{10} =$	$\frac{1}{5} - \frac{1}{10} =$	$\frac{1}{5} \times 10 =$
12.	$\frac{1}{6} + \frac{1}{12} =$	$\frac{1}{6} - \frac{1}{12} =$	$\frac{1}{6} \times 18 =$

13. Can you read the first 12 lines on this page, completing each statement correctly, in 2 minutes? Try to do this.

14. I can change halves to 4ths, to ——, to ——, to ——, to ——.

15. One half is —— twentieths. $\frac{1}{2}$ is —— fortieths.

16. One half is —— fiftieths. $\frac{1}{2}$ is —— hundredths.

17. I can change thirds to 6ths, to ——, to ——.

18. One third is —— fifteenths. $\frac{1}{3}$ is —— eighteenths.

19. One third is —— thirtieths. $\frac{1}{3}$ is —— sixtieths.

20. I can change fourths to 8ths, to ——, to ——.

21. One fourth is —— twentieths. $\frac{1}{4}$ is —— twenty-fourths. $\frac{1}{4}$ is —— thirty-seconds.

22. I can change fifths to 10ths, to ——, to ——.

23. One fifth is —— twenty-fifths. $\frac{1}{5}$ is —— thirtieths. $\frac{2}{5}$ are —— twenty-fifths.

1. $6 \div \frac{1}{2}$, means ————.* $\frac{1}{2}$ is con ————.‡
   $\frac{1}{2} \div 6$, means ————.† $\frac{1}{6}$ of ————.

2. $5 \div \frac{1}{2}$, means ————.* $\frac{1}{2}$ is con ————.
   $\frac{1}{2} \div 5$, means ————. $\frac{1}{5}$ of ————.

3. $4 \div \frac{1}{2}$, means ————. ————.
   $\frac{1}{2} \div 4$, means ————. ————.

4. $4 \div \frac{1}{3}$, means ————. ————.
   $\frac{1}{3} \div 4$, means ————. ————.

5. $3 \div \frac{1}{3}$, means ————. ————.
   $\frac{1}{3} \div 3$, means ————. ————.

---

6. One half of $\frac{1}{10}$ is —— ——. $\frac{1}{2}$ of $\frac{1}{10}$ is ——.
7. One half of $\frac{1}{30}$ is —— ——. $\frac{1}{2}$ of $\frac{1}{30}$ is ——.
8. $\frac{1}{4}$ is contained in 2 —— times. $2 \div \frac{1}{4} =$
9. $\frac{1}{5}$ is contained in 2 —— times. $2 \div \frac{1}{5} =$
10. $\frac{1}{6}$ is contained in 2 —— times. $2 \div \frac{1}{6} =$
11. $\frac{1}{9}$ is contained in 2 —— times. $2 \div \frac{1}{9} =$
12. $\frac{1}{10}$ is contained in 3 —— times. $3 \div \frac{1}{10} =$

---

13. $2\frac{1}{3} \div \frac{1}{3} =$ $2\frac{2}{3} \div \frac{1}{3} =$ $3\frac{1}{3} \div \frac{1}{3} =$ $3\frac{2}{3} \div \frac{1}{3} =$
14. $2\frac{1}{4} \div \frac{1}{4} =$ $2\frac{3}{4} \div \frac{1}{4} =$ $3\frac{1}{4} \div \frac{1}{4} =$ $3\frac{3}{4} \div \frac{1}{4} =$
15. $2\frac{1}{5} \div \frac{1}{5} =$ $2\frac{3}{5} \div \frac{1}{5} =$ $3\frac{1}{5} \div \frac{1}{5} =$ $3\frac{3}{5} \div \frac{1}{5} =$
16. $2\frac{1}{6} \div \frac{1}{6} =$ $2\frac{5}{6} \div \frac{1}{6} =$ $3\frac{1}{6} \div \frac{1}{6} =$ $3\frac{5}{6} \div \frac{1}{6} =$

* This means, *find how many times* $\frac{1}{2}$ *is contained in* 6.
† This means, *find* $\frac{1}{2}$ *of* $\frac{1}{2}$. ‡ See page 89.

Review.

1.	$\frac{2}{3} + \frac{1}{6} =$*	$\frac{2}{3} - \frac{1}{6} =$	$\frac{2}{3} \times 4 =$
2.	$\frac{2}{3} + \frac{1}{9} =$	$\frac{2}{3} - \frac{1}{9} =$	$\frac{2}{3} \times 5 =$
3.	$\frac{2}{3} + \frac{1}{12} =$	$\frac{2}{3} - \frac{1}{12} =$	$\frac{2}{3} \times 6 =$
4.	$\frac{3}{4} + \frac{1}{8} =$	$\frac{3}{4} - \frac{1}{8} =$	$\frac{3}{4} \times 2 =$
5.	$\frac{3}{4} + \frac{1}{12} =$	$\frac{3}{4} - \frac{1}{12} =$	$\frac{3}{4} \times 3 =$
6.	$\frac{2}{5} + \frac{1}{10} =$	$\frac{2}{5} - \frac{1}{10} =$	$\frac{2}{5} \times 4 =$
7.	$\frac{2}{5} + \frac{3}{10} =$	$\frac{2}{5} - \frac{3}{10} =$	$\frac{2}{5} \times 6 =$

8. $\frac{1}{2} + \frac{1}{3} =$ (Change to 6ths).† $\frac{1}{3} + \frac{1}{4} =$ (Change to ———.)
9. $\frac{1}{2} - \frac{1}{3} =$ (Change to ———.) $\frac{1}{3} - \frac{1}{4} =$ (Change to ———.)
10. $\frac{2}{3} + \frac{1}{2} =$ (Change to ———.) $\frac{3}{4} + \frac{1}{3} =$ (Change to ———.)
11. $\frac{2}{3} - \frac{1}{2} =$ (Change to ———.) $\frac{3}{4} - \frac{1}{3} =$ (Change to ———.)

Tests.

If pupils have mastered the work up to this point, they will have no difficulty with the following. The real test is the pupil's power to do that which he has not done before.

(a) Can you add $\frac{1}{3}$ and $\frac{1}{5}$? (Change to ———.)
(b) Can you subtract $\frac{1}{5}$ from $\frac{1}{4}$? (Change to ———.)
(c) Can you add $\frac{2}{5}$ and $\frac{1}{4}$? (Change to ———.)
(d) Can you add $\frac{1}{2}$ and $\frac{1}{10}$? $\frac{1}{2}$ and $\frac{1}{40}$?
(e) Multiply $\frac{3}{5}$ by 7. $\frac{2}{3}$ by 12. $\frac{2}{3}$ by $6\frac{1}{2}$.
(f) Multiply $8\frac{2}{3}$ by 6. $\frac{3}{5}$ by 50. $\frac{4}{5}$ by $7\frac{1}{2}$.
(g) Multiply $6\frac{3}{4}$ by 8. $\frac{3}{5}$ by 20. $\frac{2}{5}$ by 40.
(h) Multiply $7\frac{2}{5}$ by 5. $\frac{4}{5}$ by 12. $\frac{4}{7}$ by $6\frac{1}{2}$.
(i) Multiply $8\frac{1}{2}$ by 7. $\frac{5}{6}$ by 12. $\frac{4}{7}$ by $8\frac{1}{2}$.
(j) Multiply $9\frac{2}{3}$ by 6. $\frac{3}{4}$ by 40. $\frac{6}{7}$ by $7\frac{1}{2}$.

* See pages 125, 135, and 145.

† Lead the pupil to say,—$\frac{1}{2}$ is $\frac{3}{6}$; $\frac{1}{3}$ is $\frac{2}{6}$; $\frac{3}{6}$ and $\frac{2}{6}$ are $\frac{5}{6}$.

1. Divide 2 thirds by 1 fourth.
   2 thirds are ——— twelfths.
   1 fourth is ——— twelfths.
   ——— 12ths in ——— 12ths ——— and ——— ——— times.*

2. Divide 3 fourths by 1 third.
   3 fourths are ——— twelfths.
   1 third is ——— twelfths.
   ——— 12ths in ——— 12ths ——— and ——— ——— times.

3. Divide 1 half by 1 fifth.
   1 half is ——— tenths.
   1 fifth is ——— tenths.
   ——— tenths in ——— tenths ——— and ——— ——— times.

4. Divide $\frac{1}{2}$ by $\frac{1}{3}$. (Change to sixths.)
5. Divide $\frac{3}{4}$ by $\frac{1}{8}$. (Change to eighths.)
6. Divide $\frac{2}{3}$ by $\frac{1}{9}$. (Change to ninths.)
7. Divide $\frac{1}{2}$ by $\frac{1}{10}$. (Change to tenths.)

8. Add $\frac{1}{3}$ and $\frac{1}{4}$. Add $\frac{2}{3}$ and $\frac{1}{4}$.
9. From $\frac{1}{3}$ subtract $\frac{1}{4}$. From $\frac{2}{3}$ subtract $\frac{1}{4}$.
10. Divide $\frac{1}{3}$ by $\frac{1}{4}$. Divide $\frac{2}{3}$ by $\frac{1}{4}$.

11. $\frac{3}{4} \div \frac{1}{10}$ = $\frac{1}{10}$ of a dollar is contained in $\frac{3}{4}$ of a dollar ——— times.

12. $\frac{3}{5} \div \frac{1}{12}$ = $\frac{1}{12}$ of a foot is contained in $\frac{3}{5}$ of a foot ——— times.

13. $\frac{1}{2} \div \frac{1}{6}$ = $\frac{1}{6}$ of a pie is contained in $\frac{1}{2}$ of a pie ——— times.

14. $\frac{2}{4} \div \frac{1}{6}$ = $\frac{2}{12}$ of a foot are contained in $\frac{9}{12}$ of a foot ——— and ——— ——— times.

15. $\frac{2}{3} \div \frac{1}{6}$ = $\frac{1}{6}$ of a foot is contained in $\frac{4}{6}$ of a foot ——— times.

* { 8 apples in 8 apples 2 and 2 thirds times.
   { 8 twelfths in 8 twelfths 2 and 2 thirds times.

Six number facts to be memorized.

7 nines are 63. 9 eights are 72.
9 sevens are 63. 8 nines are 72.
8 eights are 64. 9 nines are 81.

1. Sixty-three days are —— weeks.
2. Sixty-four quarts are —— pecks.
3. Seventy-two pints are —— gallons.
4. Eighty-one ninths are —— wholes.

5. 65 is —— 7's and ——. 65 is —— 8's and ——.
6. 75 is —— 8's and ——. 75 is —— 9's and ——.
7. 82 is —— 8's and ——. 82 is —— 9's and ——.

8. Ninety inches are —— feet and —— inches.
9. Ninety days are —— weeks and —— days.

10. Nine weeks and 2 days are —— days.
11. Seven feet and 5 inches are —— inches.

12. $2\frac{3}{8}$ are —— eighths. $2\frac{5}{9}$ are —— ninths.
13. 37 eighths are ——. 37 ninths are ——.
14. $2\frac{5}{8}$ are —— eighths. $2\frac{1}{9}$ are —— ninths.
15. 43 eighths are ——. 43 ninths are ——.
16. $3\frac{5}{8}$ are —— eighths. $3\frac{5}{9}$ are —— ninths.
17. 55 eighths are ——. 55 ninths are ——.

Read first by column, then by line.

7 2's are ——.	7 5's are ——.	7 8's are ——.
7 3's are ——.	7 6's are ——.	7 9's are ——.
7 4's are ——.	7 7's are ——.	7 10's are ——.
8 2's are ——.	8 5's are ——.	8 8's are ——.
8 3's are ——.	8 6's are ——.	8 9's are ——.
8 4's are ——.	8 7's are ——.	8 10's are ——.
9 2's are ——.	9 5's are ——.	9 8's are ——.
9 3's are ——.	9 6's are ——.	9 9's are ——.
9 4's are ——.	9 7's are ——.	9 10's are ——

See diagram on page 143.

1. Draw an oblong 6¼ inches by 4 inches. Divide it as far as possible into 1-inch squares. It contains 4 rows of figures. In each row there are —— and —— —— square inches. The area of the oblong is —— square inches. 6¼ sq. in × 4 =.

Tables.*

2 times 2 are 4.	2 times 3 are 6.	2 times 4 are 8.
3 times 2 are 6.	3 times 3 are 9.	3 times 4 are 12.
4 times 2 are 8.	4 times 3 are 12.	4 times 4 are 16.
5 times 2 are 10.	5 times 3 are 15.	5 times 4 are 20.
6 times 2 are 12.	6 times 3 are 18.	6 times 4 are 24.
7 times 2 are 14.	7 times 3 are 21.	7 times 4 are 28.
8 times 2 are 16.	8 times 3 are 24.	8 times 4 are 32.
9 times 2 are 18.	9 times 3 are 27.	9 times 4 are 36.
2 times 5 are 10.	2 times 6 are 12.	2 times 7 are 14.
3 times 5 are 15.	3 times 6 are 18.	3 times 7 are 21.
4 times 5 are 20.	4 times 6 are 24.	4 times 7 are 28.
5 times 5 are 25.	5 times 6 are 30.	5 times 7 are 35.
6 times 5 are 30.	6 times 6 are 36.	6 times 7 are 42.
7 times 5 are 35.	7 times 6 are 42.	7 times 7 are 49.
8 times 5 are 40.	8 times 6 are 48.	8 times 7 are 56.
9 times 5 are 45.	9 times 6 are 54.	9 times 7 are 63.
2 times 8 are 16.	2 times 9 are 18.	9 and 4 are 13.
3 times 8 are 24	3 times 9 are 27.	8 and 5 are 13.
4 times 8 are 32.	4 times 9 are 36.	7 and 6 are 13.
5 times 8 are 40	5 times 9 are 45.	9 and 5 are 14.
6 times 8 are 48.	6 times 9 are 54.	9 and 6 are 15.
7 times 8 are 56.	7 times 9 are 63.	8 and 7 are 15.
8 times 8 are 64.	8 times 9 are 72.	9 and 7 are 16.
9 times 8 are 72.	9 times 9 are 81.	9 and 8 are 17.

* Every number fact given in these tables must be perfectly mastered. Do not omit the nine facts of addition given in the last table.

Slate Work in Addition.

(a)	(b)	(c)	(d)
$78\frac{1}{4}$	$148\frac{2}{3}$	74.8	5 h. 40 min.
$46\frac{1}{6}$	$65\frac{1}{4}$	12.6	7 h. 40 min.

(e) Find the sum of one hundred seventy-five and one half, and two hundred forty-four and one third.

Slate Work in Subtraction.

(a)	(b)	(c)	(d)
$86\frac{1}{8}$	$197\frac{1}{8}$	48.3	46 ft.
$24\frac{5}{8}$	$34\frac{4}{5}$	21.7	12 ft. 6 in.

(e) Find the difference of two hundred thirty-eight and one half, and one hundred twelve and one third.

Slate Work in Multiplication.

(a)	(b)	(c)	(d)
$37\frac{1}{2}$	$83\frac{2}{3}$	94.5	12 ft. 6 in.
6	5	5	5

(e) Find the product of one hundred thirty-six and one third multiplied by six.

Slate Work in Division.

(a)	(b)	(c)
\$7)\$455	7 tenths)455 tenths.	.7)45.5
(d)	(e)	(f)
7)\$455	7)455 tenths.	7)45.5
(g)	(h)	(i)
5)475	5)476	$5)475\frac{1}{2}$

FOURTH GRADE.

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FOURTH GRADE.

Decimals—Tenths.

Review page 70. See that the pupils can write tenths decimally; as, five tenths (.5), eight tenths (.8), twelve tenths (1.2), twenty-five tenths (2.5), one and four tenths (1.4), two and three tenths (2.3). See that the pupil clearly understands that such expressions as 2.5 may be read in two ways; thus, (a) *two and five tenths* and (b) *twenty-five tenths.*

1. 6¢ and 2¢ are ——— cents.
2. .6 and .2 are ——— tenths.

3. 6¢ less 2¢ are ——— cents.
4. .6 less .2 are ——— tenths.

5. 4¢ × 2, means, *2 times 4¢;* 2 times 4¢ are ———.
6. .4 × 2, means, *2 times .4;* 2 times .4 are ———.

7. 6¢ ÷ 2¢, means, *find how many times 2¢ are contained in 6¢;* 2¢ are contained in 6¢ ——— times.

8. .6 ÷ .2, means, *find how many times .2 are contained in .6;* .2 are contained in .6 ——— times.

9. 6¢ ÷ 2, means, *find one half of 6¢;* one half of 6¢ is ——— cents.

10. .6 ÷ 2, means, *find one half of .6;* one half of .6 is ——— tenths.

Decimals—Tenths.

Teach the pupil to read and to write such expressions as the following: $.8 (8 tenths of a dollar, or 8 tenth-dollars); $1.2 (1 and 2 tenths dollars, or twelve tenth-dollars).

1. One tenth of a dollar = ——— dime. $.2 =
2. One tenth of a dollar = ——— cents. $.3 =
3. Three tenths of a dollar = ——— dimes. $.5 =
4. Four tenths of a dollar = ——— cents. $.6 =
5. Fifty cents = ——— dimes. Seventy cents =
6. Sixty cents = ——— tenths of a dollar.
7. Eight dimes = ——— tenths of a dollar.

8. $.8 = ——— dimes. $.8 = ——— cents.
9. $.9 = ——— cents. $.9 = ——— dimes.
10. $1.2 = ——— dollar and ——— dimes. $1.4 =
11. $1.2 = ——— dimes. $1.4 = ——— dimes.
12. $1.2 = ——— dollar and ——— cents. $1.5 =

13. Mary had $.4 in her pocket and $.3 in her bank; in both she had ————————.
14. Jane had $.9; she spent $.3; she then had ———.
15. Sarah paid $.4 for each of three books; for all she paid ————.
16. Alice had $.8 with which to buy tea at $.4 a pound; she could buy ——— pounds.
17. Maude paid $.6 for two pounds of coffee; one pound cost ————.

Read and complete, then copy and complete.*

$1.2 + $1.3 = $2.8 − $.6 = $2.3 × 2 =
$2.3 + $2.3 = $1.2 − $.6 = $1.5 × 2 =
$.8 ÷ $.2 = $.8 ÷ 2 =
$.9 ÷ $.3 = $.9 ÷ 3 =

*If the pupil hesitates when asked to complete one of these expressions, ask him to give its meaning. See p. 155.

Decimals—Tenths.

1. .5 + .3. (To be read, 5 tenths plus 3 tenths.)

(a) .5 + .3, means, .5 and .3. (b) .5 and .3 are ——— ———. (c) Arthur earned .5 of a dollar Monday and .3 of a dollar Tuesday; in both days he earned ————.

2. .9 − .4. (To be read, 9 tenths minus 4 tenths.)

(a) .9 − .4, means, .9 less .4. (b) .9 less .4 are ——— ———. (c) Harry had .9 of a dollar; he spent .4 of a dollar; he then had ———— .

3. .4 × 3. (To be read, 4 tenths multiplied by 3.)

(a) .4 × 3, means, 3 times .4. (b) 3 times .4 are ——— ———. (c) If one yard of ribbon is worth .4 of a dollar, 3 yards are worth ——— tenths, or ——— and ——— tenths dollars.

4. 1.2 ÷ .4. (To be read, 12 tenths divided by 4 tenths.)

(a) 1.2 ÷ .4, means, find how many times .4 are contained in 1.2. (b) .4 are contained 1.2 ——— times. (c) James had 1.2 dollars with which to buy tea at .4 of a dollar a pound; he could buy ——— pounds.

5. 1.2 ÷ 4. (To be read, 12 tenths divided by 4.)

(a) 1.2 ÷ 4, means, find one fourth of 1.2. (b) One fourth of 1.2 is ——— tenths. (c) William paid 1.2 dollars for 4 pounds of coffee; one pound cost ——— tenths of a dollar.

Using the above as models, (a) tell the meaning of the following expressions, (b) complete them, and (c) tell the suggested number stories; then copy and complete.

.8 + .6 =	1.2 − .6 =	.6 × 4 =	2.4 ÷ .4 =	2.4 ÷ 4 =
.9 + .5 =	1.5 − .7 =	.8 × 3 =	2.4 ÷ .3 =	2.4 ÷ 3 =
1.5 + .4 =	1.8 − .8 =	.7 × 4 =	2.5 ÷ .5 =	2.5 ÷ 5 =

Decimals - Tenths.

1. The sum of 5.2 and 4.3 is ——.* 3.5 + 3.5 =
2. The sum of 4.6 and 4.6 is ——. 5.6 + 5.6 =
3. The sum of 3.6 and 4.6 is ——. 3.7 + 3.7 =
4. The sum of 4.7 and 5.7 is ——. 4.8 + 5.8 =

5. 10.2 + 10.2 = 10.8 + 10.8 =
6. 10.2 + 12.2 = 20.3 + 20.3 =
7. 20.9 + 20.9 = 20.6 + 20.7 =
8. 23.4 + 20.4 = 23.5 + 22.4 =
9. 23.6 + 22.6 = 23.7 + 22.7 =

10. The sum of two and six tenths, and four and three tenths is ————.

11. The sum of eight and three tenths, and four and two tenths is ————.

12. Joseph paid $6.5 for a suit of clothes and $2.2 for a hat; for both he paid ————.

13. In the month of September the rainfall in Chicago was 3.4 inches; in October it was 2.6 inches; in both months it was ————.*

(a) Tell the meaning of the following expressions, b) complete them, and (c) tell the suggested number stories; then copy and complete. See page 157.

2.5 × 2 = 1.6 ÷ .4 = 1.6 ÷ 4 =
3.5 × 2 = 1.5 ÷ .3 = 1.5 ÷ 3 =

Copy and add

(a)	(b)	(c)	(d)	(e)
24.7	37.3	46.2	45.5	84
11.3	84	28.4	22	38.6
42	21.5	72.8	64	35.9

(f) Add 25.3, 46, and 32.8. (g) Add 7.5, 46.3, and 54.5.

*Solve problems 1 to 13, *first*, without a pencil; then, with a pencil.

Decimals—Tenths.

1. The difference of 8.6 and 4.3 is ——.* 8.6 + 4.3 =
2. The difference of 8.2 and .6 is ——. 8.2 + .6 =
3. The difference of 8 and 4.2 is ——. 8 + 4.2 =
4. The difference of 8.5 and 1.6 is ——. 8.5 + 1.6 =

5.	20.6 − 10.2 =	20.6 + 10.2 =
6.	15.5 − 10.3 =	15.5 + 10.3 =
7.	20.2 − 10.6 =	20.2 + 10.6 =
8.	23.8 − 10.5 =	23.8 + 10.5 =

9. Cyrus had $4.6; he paid $2.5 for a book; he then had ——.

$4.6 = —— dollars and —— cents.
$2.5 = —— dollars and —— cents.
$2.1 = —— dollars and —— cents.

10. A farmer received $4.7 for a sheep and $3.5 for a pig; for both he received —— and —— tenths dollars.*

$4.7 = —— dollars and —— cents.
$3.5 = —— dollars and —— cents.
$8.2 = —— dollars and —— cents.

(a) Tell the meaning of the following expressions, (b) complete them, and (c) tell suggested number stories; then copy and complete. See page 157.

2.5 × 3 =	2.5 ÷ .5 =	2.5 ÷ 5 =
3.5 × 3 =	3.5 ÷ .5 =	3.5 ÷ 5 =

Write in figures and perform the following:

(a) Add twenty-four and six tenths dollars, eight tenths of a dollar, and forty-five dollars.

(b) From forty-three and eight tenths dollars, take one and four tenths dollars.

(c) Add $27.3, $56, $14.5, $28, and $.9.

*Solve problems 1 to 10, *first*, without a pencil; then, with a pencil.

Decimals—Tenths.

1. The product of 8.3 and 2 is ——.* 8.3 + 2 =
2. The product of 3.5 and 2 is ——. 3.5 − 2 =
3. The product of 2.4 and 3 is ——. 2.4 − .3 =
4. The product of 1.5 and 4 is ——. 1.5 + .4 =

5. 3.2 × 3 =	3.2 + 3 =	3.2 − 3 =
6. 2.1 × 4 =	2.1 + .4 =	2.1 − .4 =
7. 2.3 × 4 =	2.3 + 4 =	2.3 − .4 =
8. 2.5 × 5 =	2.5 + .5 =	2.5 − .5 =

9. At $4.5 a cord, 3 cords of wood will cost ——. $6.5 × 3 =

10. A man had $5.3 in one pocket and $3.9 in another; in both he had ——. $6.4 + $1.8 =

11. Chester had $6.3; Elmer had $5.1; Chester had —— dollars more than Elmer. $7.2 − $4.8 = *

12. 15 tenth-dollars = —— and —— tenths dollars.
13. 2 and 5 tenths dollars = —— tenth-dollars.
14. 35 tenth-dollars = —— and —— tenths dollars.
15. 1 and 8 tenths dollars = —— tenth-dollars.

(a) Tell the meaning of the following expressions, (b) complete them, and (c) tell suggested number stories; then copy and complete. See page 157.

2.2 × 5 =	2.4 ÷ .6 =	2.4 ÷ 6 =
2.4 × 5 =	2.4 ÷ .8 =	2.4 ÷ 8 =

Write in figures and perform the following:

(a) Add seventy-five and four tenths dollars, sixty-four dollars, and two and seven tenths dollars.

(b) From eighty-six and three tenths dollars, take thirty-one and seven tenths dollars.

(c) Multiply twenty-four and five tenths dollars by five.

$31.2 × 4 = $47.4 × 3 =

* Solve problems 1 to 11, *first*, without a pencil; then, with a pencil.

Decimals—Tenths.

1. The quotient of $4.5 divided by $.5 is ——.* †
2. The quotient of $4.5 divided by 5 is ——.*

3. The quotient of $3.2 divided by $.8 is ——.
4. The quotient of $3.2 divided by 8 is ——.

5. The quotient of $4.8 divided by $.6 is ——.
6. The quotient of $4.8 divided by 6 is ——.

7. The quotient of $3.0 divided by $.5 is ——.
8. The quotient of $3.0 divided by 5 is ——.

9. The sum of two numbers is 15; one of the numbers is 10; the other number is ——.

10. The sum of two numbers is 7.5; one of the numbers is 3.2; the other number is ——.

11. The difference of two numbers is 4; the greater number is 12; the less number is ——.

12. The difference of two numbers is 3.4; the greater number is 12.8; the less number is ——.

13. The difference of two numbers is 5; the less number is 8; the greater number is ——.

14. The difference of two numbers is 5.3; the less number is 8.3; the greater number is ——. †

Write in figures and perform the following:

(a) Divide sixty-four and two tenths by two.
(b) Divide sixty-four and two tenths by two tenths.
(c) Divide forty-eight and six tenths by three.
(d) Divide forty-eight and six tenths by three tenths.

* $4.5 may, in this place, be read forty-five tenth-dollars. The pupil will soon discover which method of reading a decimal will make the completion of the statement the easier. If there is any hesitation on the part of the pupil ask for the meaning of the expression. See page 157.

† Solve problems 1 to 14, *first*, without a pencil; then, with a pencil.

Decimals—Tenths.

Read the first ten lines twice; the first time read 1.2, *twelve tenths;* the second time read it, *one and two tenths*, etc.

1. One half of 1.2 is ——— . 1.2 = $\frac{1}{2}$ of ———.
2. One third of 1.2 is ———. 1.2 = $\frac{1}{3}$ of ———.
3. Two thirds of 1.2 are ———. 1.2 = $\frac{2}{3}$ of ———.
4. One fourth of 1.2 is ———. 1.2 = $\frac{1}{4}$ of ———.
5. Three fourths of 1.2 are ———. 1.2 = $\frac{3}{4}$ of ———.

6. .8 is what part of 1.2? .4 of 1.2?
7. .9 is what part of 1.2? .6 of 1.2?
8. .3 is what part of 1.2? 1.2 of 2.4?
9. 1.2 is what part of 1.6? 1.2 of 1.8?
10. 1.2 is what part of 3.6? 1.2 of 4.8?

11. One fourth of 2 (2.0) is ——— tenths.
12. Three fourths of 2 are ——— and ——— tenths.
13. One fifth of 2 (2.0) is ——— tenths.
14. Three fifths of 2 are ——— and ——— tenths.
15. .4 is ——— ——— of 2. .5 is ——— ——— of 2.
16. .8 is ——— ——— of 2. 1.5 is ——— ——— of 2.

(a) Tell the meaning of the following expressions, (b) complete them, and (c) tell the suggested number stories; then copy and complete. See page 157.

2.7 × 2 =	3.6 ÷ .9 =	3.6 ÷ 9 =
2.8 × 2 =	3.6 ÷ .6 =	3.6 ÷ 6 =

Tell the meaning, then copy and perform.

(a)	(b)	(c)	(d)	(e)
5)$2.	5)$3.	5)$4.	5)$6.	5)$7.
(f)	(g)	(h)	(i)	(j)
5)$22.	5)$23.	5)$24.	5)$25.	5)$26.
(k)	(l)	(m)	(n)	(o)
5)322	5)323	5)324	5)326	5)327

Decimals—Tenths.

Lead the pupil to perceive that 60 ÷ 10 = 6.0; that 50 ÷ 10 = 5.0; that 45 ÷ 10 = 4.5; that 23 ÷ 10 = 2.3, etc.

1. One tenth of 20 is ——.	.2 of 20 =
2. One tenth of 30 is ——.	.2 of 30 =
3. One tenth of 40 is ——.	.2 of 40 =
4. One tenth of 50 is ——.	.2 of 50 =
5. Three tenths of 20 are ——.	.4 of 20 =
6. Three tenths of 30 are ——.	.4 of 30 =
7. Three tenths of 40 are ——.	.4 of 40 =
8. Seven tenths of 20 are —— .	.6 of 20 =
9. .1 of 24 is —— and —— tenths.	.2 of 24 =
10. .1 of 32 is —— and —— tenths.	.2 of 32 =
11. .1 of 43 is —— and —— tenths.	.2 of 43 =

12. .1 of 23 =	.2 of 23 =	.3 of 23 =
13. .1 of 12 =	.2 of 12 =	.3 of 12 =
14. .1 of 33 =	.2 of 33 =	.3 of 33 =
15. .1 of 42 =	.2 of 42 =	.3 of 42 =

(a) Multiply $24.6 by 3.	(b) 35.7 × 2 =
(c) Multiply $36.5 by 5.	(d) 41.8 × 4 =
(e) Divide $36.8 by 2.	(f) 45.6 ÷ 2 =
(g) Divide $84.9 by 3.	(h) 87.6 ÷ 3 =
(i) Find 1 tenth of $270.	(j) Find .2 of $270.
(k) Find 1 tenth of $274.	(l) Find .2 of $274.
(m) Divide $46.2 by $.2.*	(n) $47.2 ÷ 2 =
(o) Divide $56.4 by $.3.	(p) $57.6 ÷ 3 =
(q) Divide $61.2 by $.4	(r) $62.4 ÷ 4 =

* Lack of clearness of perception on the part of the pupil should be met with the question, "*What is the meaning of the expression?*" Often ask, too, for the "suggested number story." $46.2 ÷ $.2, means; find how many times 2 tenths of a dollar are contained in 462 tenths dollars. Two tenths of a dollar are contained in 462 tenths dollars 231 times. I had $46.2 with which to buy cloth at $.2 a yard: I could buy 231 yards.

Decimals—Tenths.

Lead the pupil to perceive that 1 ÷ 10 = .1; that 2 ÷ 10 = .2, etc.

1. One tenth of 4 is —— tenths.	.2 of 4 =
2. One tenth of 3 is —— tenths.	.2 of 3 =
3. One tenth of 6 is —— tenths.	.2 of 6 =
4. One tenth of 5 is —— tenths.	.2 of 5 =
5. One tenth of $2 is —— ——.	.2 of $2 =
6. One tenth of $8 is — — .	.2 of $8 =
7. One tenth of $7 is - ——————.	.2 of $7 =
8. One tenth of $9 is —— ——.	.2 of $9 =
9. Three tenths of $2 =	.4 of $2 =
10. Three tenths of 2 inches =	.4 of 2 in. =
11. Four tenths of $2 =	.5 of $2 =
12. Four tenths of 2 inches =	.5 of 2 in. =
13. Six tenths of $2 =	.7 of $2 =
14. Six tenths of 2 inches =	.7 of 2 in. =

(a) Find 2 tenths of 54.
(b) Find 3 tenths of 75.
(c) Find five tenths of 82.
(d) Find seven tenths of 96.

Model.
.1 of 54 = 5.4
.2 of 54 = 10.8

(e) Find two tenths of 620.	(f) .2 of 624.
(g) Find three tenths of 430.	(h) .3 of 336.
(i) Find four tenths of 580.	(j) .4 of 582.
(k) Find five tenths of 660.	(l) .5 of 666.
(m) Find six tenths of 540.	(n) .6 of 543.
(o) Find seven tenths of 420.	(p) .7 of 423.
(q) Find eight tenths of 260.	(r) .8 of 264.

(a) Tell the meaning of the following expressions, (b) copy and complete, and (c) tell the suggested number stories. See page 157.

(s) $375.5 × 3 =	(t) $375.6 ÷ 3 =	(u) $375.6 ÷ $.3 =
(v) $446.5 × 5 =	(w) $446.5 ÷ 5 =	(x) $446.5 ÷ $.5 =
(y) $294.4 × 4 =	(z) $294.4 ÷ 4 =	(*) $494.4 ÷ $.4 =

Decimals—Tenths.

Teach the pupil that the expression, 20 × .2 (20 multiplied by .2), means, *find 2 tenths of 20.* See page 114. The sign of multiplication on this page, as on all the preceding pages, should be read *multiplied by*, not *times.*

1. \$30 × .2, means, find .2 of \$30. .2 of \$30 =
2. \$40 × .2, means, find .2 of \$40. .2 of \$40 =
3. \$20 × .3, means, ————. .3 of \$20 =
4. \$50 × .6, means, ————. .6 of \$50 =

5. \$23 × .1, means, find .1 of \$23. .1 of \$23 =
6. \$23 × .2, means, ————. .2 of \$23 =
7. \$34 × .2, means, ————. .2 of \$34 =
8. \$22 × .4, means, ————. .4 of \$22 =

9. \$6 × .1, means, find 1 tenth of \$6. .1 of \$6 =
10. \$6 × .2, means, ————. .2 of \$6 =
11. \$4 × .3, means, ————. .3 of \$4 =
12. \$8 × .4, means, ————. .4 of \$8 =

13. \$50 × .3 = \$30 × .4 = \$60 × .5 =
14. \$24 × .2 = \$31 × .3 = \$12 × .6 =
15. \$8 × .2 = \$7 × .5 = \$14 × .8 =

16. \$20 × 2.3, means, take 2 times \$20 plus 3 tenths of \$20. \$20 × 2.3 = \$20 × 2.4 =
17. \$30 × 2.3, means, take 2 times \$30 plus 3 tenths of \$30. \$30 × 2.3 =
18. \$12 × 2.3, means, ————. \$12 × 2.3 = \$12 × 2.4 =

(a) Multiply \$240 by 3. (b) Multiply \$240 by .3.
(c) Multiply \$245 by 3. (d) Multiply \$245 by .3.
(e) Multiply \$324 by 4. (f) Multiply \$324 by .4.

NOTE.— The pupil may be allowed to use such expressions as 2.3 times 20 when he clearly understands that 2.3 times a number means, *two times the number plus three tenths of the number.*

Decimals—Tenths.

1. Multiply $275 by 2.3. This means, *find two times $275 plus three tenths of $275.*

Operation No. 1.

$275.
2.3

$550. (2 times $275.)
$82.5 (.3 of $275.)

$632.5 (2.3 times $275.)

Explanation.

Two times $275 are $550.
One tenth of $275 is $27.5.
Three tenths of $275 are $82.5.
$550 + $82.5 = $632.5.

Operation No. 2.

$275.
2.3

$82.5 (.3 of $275.)
$550. (2 times $275.

$632.5 (2.3 times $275.)

Explanation.

One tenth of $275 is $27.5.
Three tenths of $275 are $82.5.
Two times $275 are $550.
$550 + $82.5 = $632.5.

Suggested Number Story.

If one acre of land is worth $275,
1 tenth of an acre is worth .
3 tenths of an acre are worth ———.
2 acres are worth .
2.3 acres are worth ———.

In the manner indicated above, require pupils (a) to tell the meaning of each of the following, (b) to perform, and (c) to tell a suggested number story. When Operation No. 2 is employed, require the pupil to write a decimal point *immediately after* writing the tenths' figure of the first partial product. While multiplying by 3, in the example given above, the pupil must know that he is multiplying $27.5 by 3, not $275.

(a) Multiply $245 by 2.3.
(b) Multiply $146 by 2.3.
(c) Multiply $234 by 3.2.
(d) Multiply $156 by 3.2.
(e) Multiply $426 by 3.4.
(f) Multiply $321 by 3.4.
(g) Multiply $347 by 4.3.
(h) Multiply $252 by 4.3.

Decimals—Tenths.

1. Victor lives 3.4 miles north of the Court House; Harry lives 2.3 miles south of the Court House; from Victor's home to Harry's home it is ——— miles.*

(a) William lives 27.4 miles north of Waukegan; Henry lives 46.5 miles south of Waukegan. How far is it from William's home to Henry's home?

2. Mr. Dow lives 2.4 miles west of Chicago; Mr. Just lives 5.6 miles west of Chicago; from Mr. Dow's home to Mr. Just's home it is ——— miles.

(b) Mr. Jones lives 24.3 miles west of Chicago; Mr. Adams lives 51.7 miles west of Chicago. How far is it from Mr. Jones's home to Mr. Adams's home?

3. Jane lives 2.4 miles south of the Chicago post-office; Helen lives 3.5 miles south of Jane's home; from the Chicago post-office to Helen's home it is ——— miles.

(c) Mrs. Smith lives 17.3 miles south of the Chicago post-office; Mrs. Brown lives 24.5 miles south of Mrs. Smith's home. How far is it from the Chicago post-office to Mrs. Brown's home?

4. From Arthur's home to the schoolhouse it is 2.3 miles; Arthur's brother takes him to school each morning and returns home; at night he goes again to the schoolhouse and takes Arthur home; Arthur's brother must travel each day ——— miles. $2.3 \times 4 =$

(d) From Waukegan to Chicago it is 35.3 miles. Mr. Spoor is an engineer. He lives in Waukegan. His daily "run" is from Waukegan to Chicago in the morning, and from Chicago to Waukegan in the afternoon. One day he made two such "round trips." How far did he travel?

*Require the pupil to represent upon his slate or upon the blackboard the relative positions of the places mentioned in each problem on this page.

Decimals—Tenths.

5. Sarah paid $1.2 for some books that cost $.3 each; there were —— books. I found the number of books that Sarah bought by finding how many times $.3 is contained in $1.2. $.3 is contained in $1.2 —— times. Show upon the blackboard how this would appear as an example in division.*

Give the answer to each of the following:

$.4)$1.6 $.2)$2.4 $.2)$4.6 $.5)$7.5 $.5)$27.5

(e) Sarah's mother paid $27.6 for some chickens that cost $.3 each. How many chickens did she buy? I can find the number of chickens by finding how many times ————.

6. John paid $1.2 for 3 second readers; each reader cost ————. I found the cost of 1 reader by finding ⅓ of $1.2. ⅓ of $1.2 is ————. Show upon the blackoard how this would appear as an example in division.†

Give the answer to each of the following:

4)$1.6 2)$2.4 2)$4.6 5)$7.5 5)$27.5

(f) John's father paid $34.5 for 3 tons of hay. How much did one ton cost? I can find the cost of one ton by finding ————.

(a) Tell the meaning, (b) copy and complete, and (c) tell the suggested number stories.

(g)	(h)	(i)	(j)
$.5)$46.5	5)$46.5	$.3)$53.1	3)$53.1

* $.3)$1.2
$.4
4 times.

† 3)$1.2
$.4
This process is often very properly called partition. That it is also division is very apparent, since it is finding one of the three equal parts into which $1.2 *is divided.* It is essential to good thinking that the pupil should be led to distinguish sharply between the two processes, or "cases," of division. Therefore, examples of each are, again and again, placed in close proximity upon these pages. See that the pupil knows what he is required to do in each such problem; whether to *find how many times something is contained in*, or to *find some part of the given number.*

Decimals—Tenths.

7. Henry paid $4 for some young ducks at $.2 each; there were —— ducks. I found the number of ducks that Henry bought by finding how many times ————. Show upon the blackboard how this would appear as an example in division.

Give the answer to each of the following:

$.2)$6.0 $.4)$8.0 $.2)$10. $.5)$10. $.2)$8.

(k) Henry's father paid $48 for some fence posts that cost $.2 each. How many posts?

8. Jane paid $6 for 4 yards of velvet; each yard cost ————. I found the cost of one yard by finding ¼ of ————. Show upon the blackboard how this would appear as an example in division.

Give the answer to each of the following:

2)$5.0 4)$10.0 2)$7. 2)$9. 4)$2.

(l) Jane's mother paid $26 for 4 curtains. How much did one curtain cost?

9. William paid $2.3 for a pair of shoes; at the same rate 3 pairs of shoes would cost ————. I found the cost of 3 pairs by multiplying ————————. Show upon the blackboard how this would appear as an example in multiplication.

Give the answer to each of the following:

$2.3	$3.4	$2.5	$3.5	$6.2
2	2	2	2	3

(m) William's father paid $36.5 for a cow. At the same rate, how much would 3 cows cost?

Decimals—Tenths.

10. Mary paid $1.5 for 3 dozen oranges; one dozen oranges cost ————. I found the cost of one dozen by finding ————————. Show upon the blackboard how this would appear as an example in division.

Give the answer to each of the following:

5)$2.5 4)$1.6 3)$1.8 2)$6.4 2)$5.4

(n) Mary's mother paid $27.5 for 5 chairs. How much did one chair cost?

11. Alice paid $2.5 for ribbon that cost $.5 a yard; she bought —— yards. I found the number of yards by finding ————————. Show upon the blackboard how this would appear as an example in division.

Give the answer to each of the following:

$.5)$2.5 $.3)$1.8 $.2)$3.6 $.2)$5.2 $.2)$4.6

(o) Alice's mother paid $27.6 for a carpet that cost $.6 a yard. How many yards did she buy?

12. Peter paid $1.3 for a hat; at the same rate 3 hats would cost ————. I found the cost of 3 hats by multiplying ————————. I could find the cost of 4 hats by multiplying ————. Show upon the blackboard how these would appear as examples in multiplication.

Give the answer to each of the following:

$2.4	$2.5	$2.6	$2.7	$2.8	$2.9
2	2	2	2	2	2

(p) Peter's father paid $74.6 for a horse; at the same rate how much would 4 horses cost?

Decimals—Tenths.

13. Mr. Brown had 1.8 acres of land which he divided into lots, each containing .3 of an acre; there were —— lots. I found the number of lots by finding ————. Show upon the blackboard how this would appear as an example in division.

Give the answer to each of the following:

.3 of an acre)1.5 acres. .5 of an acre)3.5 acres.

.4 of an acre)2.4 acres. .6 of an acre)4.2 acres.

(q) Mr. Lyon had 46.8 acres of land which he divided into lots each containing .3 of an acre. How many lots?

24. Mr. Nichols had 1.8 acres of land which he divided into 3 equal parts; each lot contained ————. I found the amount of land in each lot by finding ————. Show upon the blackboard how this would appear as an example in division.

Give the answer to each of the following:

3)1.5 acres. 5)3.5 acres. 4)8.4 acres. 3)6.6 acres.

15. Mr. White had three equal lots of land; each lot contained 2.3 acres; in all he had —— acres. I found how much land he had by multiplying ————. Show upon the blackboard how this would appear as an example in multiplication.

Give the answer to each of the following:

$$\begin{array}{llll} 2.1 \text{ acres.} & 2.2 \text{ acres.} & 2.3 \text{ acres.} & 2.4 \text{ acres.} \\ \underline{\quad 3 \quad} & \underline{\quad 3 \quad} & \underline{\quad 3 \quad} & \underline{\quad 3 \quad} \end{array}$$

(r) Mr. Black had 3 equal lots of land; each lot contained 25.7 acres. How much land had he in all?

Decimals—Tenths.

16. Robert had $1.2; Peter had $\frac{1}{3}$ as much; Peter had ———.

(s) Mr. Ford had $64.2; Mr. Davis had $\frac{1}{3}$ as much. How much money did Mr. Davis have?

17. Mr. Frank's hat cost $1.2; this was $\frac{1}{3}$ as much as his coat cost; his coat cost ———. They both cost ———.

(t) A harness cost $24.5; this was $\frac{1}{3}$ as much as a horse cost. How much did the horse cost? How much did both together cost?

18. Alice's hat cost $1.2; her gloves cost $\frac{2}{3}$ as much; her gloves cost ———; both together cost ———.

(u) Mr. Pratt's buggy cost $136.5; his horse cost $\frac{2}{3}$ as much. How much did his horse cost? How much did both together cost?

19. Verne's gloves cost $1.2; this was $\frac{2}{3}$ as much as her hat cost; her hat cost ———; both together cost ———.

Mrs. Hill's new curtains cost $85.4; this was $\frac{2}{3}$ as much as her carpets cost.

(v) How much did the carpets cost?

(w) How much did both together cost?

(x) How much more did the carpets cost than the curtains?

(y) How much less than $100 did the curtains cost?

(z) How much more than $100 did the carpets cost?

20. $1.4 is $\frac{2}{3}$ of ———. $\frac{2}{3}$ of 1.5 =

(a) $36.8 is $\frac{2}{3}$ of how many dollars? (b) $\frac{2}{3}$ of 36.6 =

(c) $54.2 is $\frac{2}{3}$ of how many dollars? (d) $\frac{2}{3}$ of 55.2 =

(e) $17.4 is $\frac{2}{3}$ of how many dollars? (f) $\frac{2}{3}$ of 18.6 =

(g) $45.6 is $\frac{2}{4}$ of how many dollars? (h) $\frac{2}{4}$ of 45.6 =

(i) $53.4 is $\frac{2}{4}$ of how many dollars? (j) $\frac{2}{4}$ of 52.4 =

(k) $62.1 is $\frac{2}{4}$ of how many dollars? (l) $\frac{2}{4}$ of 65.6 =

Decimals—Tenths.

21. If 2 bushels of wheat are worth $1.6, 3 bushels of wheat are worth ——————.

(m) If 2 tons of bran are worth 28.8, how much are 3 tons of bran worth?

22. If 3 bushels of apples are worth $1.8, 2 bushels of apples are worth ——————.

(n) If 3 tons of oil meal are worth $73.5, how much are 2 tons of oil meal worth?

23. If 3 bushels of corn are worth $1.2, 4 bushels of corn are worth ——————.

(o) If 3 tons of nails are worth $106.5, how much are 4 tons of nails worth?

(a) Tell the meaning, (b) complete, and (c) tell the suggested number stories.

1. $60 × .2 =*
2. $63 × .2 =*
3. $5.4 × 2. =
4. $50 × 2.2 =*
5. $55 × 2.2 =*
6. $2.7 ÷ $.9 =
7. $2 ÷ $.4 =
8. $3.6 ÷ 9 =

(a) Tell the meaning, (b) copy and complete, (c) tell the suggested number stories.

(p) $740 × .2 =
(q) $745 × .2 =
(r) $83.6 × 2 =
(s) $840 × 2.2 =†
(t) $635 × 4.2 =†
(u) $65.2 ÷ $.4 =
(v) $78 ÷ $.4 =
(w) $45.9 ÷ 9 =

24. If 4 lbs. of coffee are worth $1.6, 5 lbs. of coffee are worth ——————.

(x) If 4 acres of land are worth $97.2, how much are 7 acres worth?

(y) If 5 tons of hay are worth $62.5, how much are $6\frac{1}{2}$ tons worth?

* See page 165. † See page 166.

Decimals—Tenths.

(a) Tell the meaning.* (b) Copy and solve. (c) Tell the suggested number stories.

(a) Find the sum of $27.2, $46.8, and $128.
(b) Find the difference of $325.6 and $147.2.
(c) Find the product of $625.2 multiplied by 6.
(d) Find the product of $542 multiplied by .4.†
(e) Find the product of $542 multiplied by 3.4.
(f) Find the quotient of $64.8 divided by $.4.
(g) Find the quotient of $64.8 divided by 4.
(h) Find the quotient of $648 divided by $.4.
(i) Find the quotient of $583 divided by 2.

(j) Find the sum of $146.2, $37, and $275.8.
(k) Find the difference of $27.5 and $256.2.
(l) Find the product of $348.3 multiplied by 4.
(m) Find the product of $2142 multiplied by .7.
(n) Find the product of $362 multiplied by 4.5.
(o) Find the quotient of $275.2 divided by $.8.
(p) Find the quotient of $275.2 divided by 8.
(q) Find the quotient of $272 divided by $.8.
(r) Find the quotient of $756 divided by 5.

(s) $355.4 × 7 =
(t) $248 × .6 =
(u) $271 × 5.2 =
(v) $271 × 2.2 =
(w) $66.5 ÷ $.5 =
(x) $66.5 ÷ 5 =
(y) $665 ÷ $.5 =
(z) $554 ÷ 4 =

* Require the pupil to read this page aloud several times, giving the meaning of each problem before assigning it for seat work. He should recite as follows: Problem (d). Find the product of $542 multiplied by .4. This means, *find 4 tenths of $542.* Problem (f). Find the quotient of $64.8 divided by $.4. This means, *find how many times $.4 is contained in $64.8.* Problem (g). Find the quotient of $64.8 divided by 4. This means *find 1 fourth of $64.8.*

† $542 × .4 = $216.8 The pupil may be required to put the work on his slate or paper as here indicated; but he should be taught to think that, to multiply $542 by .4, means, to find .4 of $542; that one tenth of $542 is $54.2. He should be required to write the decimal point in the product *immediately after* making the figure that represents the number of tenths—in this case the figure 8.

Common Fractions.

halves sevenths fourteenths

1. One half is ——— fourteenths.
2. One seventh is ——— fourteenths.
3. Two sevenths are ——— fourteenths.
4. Three sevenths are ——— fourteenths.
5. One half and 1 fourteenth are ————.
6. One half less 2 fourteenths are ————.
7. Two sevenths and 1 fourteenth are ————.
8. Two sevenths less 1 fourteenth are ————.
9. Three sevenths and 1 fourteenth are ————.
10. Three sevenths less 1 fourteenth are ————.

11. $\frac{1}{2} + \frac{3}{14}$, means ————. $\frac{1}{2}$ and $\frac{3}{14}$ =
12. $\frac{1}{2} - \frac{3}{14}$, means ————. $\frac{1}{2}$ less $\frac{3}{14}$ =
13. $\frac{3}{7} \times 5$, means ————. 5 times $\frac{3}{7}$ =
14. $14 \times \frac{3}{7}$, means ————.* $\frac{3}{7}$ of 14 =
15. $14 \times 2\frac{3}{7}$, means ————.† $2\frac{3}{7}$ times 14 =
16. $\frac{3}{7} + \frac{1}{14}$, means ————.‡ $\frac{1}{14}$ is ———.
17. $2 \div \frac{1}{7}$, means ————.§ $\frac{1}{7}$ is ———.
18. $\frac{1}{7} \div 2$, means ————.‖ $\frac{1}{2}$ of $\frac{1}{7}$ =

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$175\frac{2}{7}$	$875\frac{1}{2}$	$374\frac{2}{7}$	$7)721\frac{1}{2}$
$374\frac{1}{2}$	$248\frac{1}{7}$	4	

(a) Tell the meaning. (b) Copy and complete. (c) Tell the suggested number story.

(e) 5 pecks)365 pecks.

(f) 5)365 pecks.

* 1¼ multiplied by ⅞, means, find ⅞ of 14. See page 114.
† 14 multiplied by 2⅞, means, find 2 times 14 plus ⅞ of 14.
‡ ⅞ divided by $\frac{1}{14}$, means, find how many times $\frac{1}{14}$ is contained in ⅞.
§ 2 divided by ⅐, means, find how many times ⅐ is contained in 2.
‖ ⅐ divided by 2, means, find ½ of ⅐.

Common Fractions.

1. Add $\frac{5}{7}$ and $\frac{1}{2}$. ($\frac{5}{7} = \frac{10}{14}$. $\frac{1}{2} = \frac{7}{14}$)
2. Add $\frac{7}{8}$ and $\frac{3}{4}$. (Change $\frac{3}{4}$ to $\frac{6}{8}$)

3. From $\frac{4}{7}$ subtract $\frac{1}{2}$. ($\frac{4}{7} = \frac{8}{14}$. $\frac{1}{2} = \frac{7}{14}$)
4. From $1\frac{1}{8}$ subtract $\frac{1}{3}$. (Change $\frac{1}{3}$ to $\frac{3}{9}$)

5. Multiply 6 by $5\frac{2}{3}$. (5 times 6, plus $\frac{2}{3}$ of 6)
6. Multiply $8\frac{1}{2}$ by 6. (6 times $\frac{1}{2}$, plus 6 times 8)

7. Divide $\frac{1}{2}$ by 7. (Find $\frac{1}{7}$ of $\frac{1}{2}$).
8. Divide 4 by $\frac{2}{7}$. (Find how many times, etc.)

9. Find the sum of 2.4 and $1\frac{1}{5}$. ($\frac{1}{5} = \frac{2}{10}$).
10. Find the sum of $3\frac{1}{2}$ and $2\frac{3}{14}$. ($\frac{1}{2} = \frac{7}{14}$).

11. Find the difference of $3\frac{1}{5}$ and 1.3. ($\frac{1}{5} = \frac{2}{10}$)
12. Find the difference of $4\frac{1}{2}$ and $2\frac{1}{14}$. ($\frac{1}{2} = \frac{7}{14}$)

13. Find the product of 8 multiplied by $4\frac{3}{4}$.
14. Find the product of $4\frac{3}{4}$ multiplied by 8.

15. Find the quotient of $\frac{3}{7}$ divided by 2.
16. Find the quotient of 2 divided by $\frac{3}{7}$.*

17. $\frac{1}{2} + \frac{1}{3} + \frac{1}{6} = ?$ ($\frac{1}{2} = \frac{3}{6}$. $\frac{1}{3} = \frac{2}{6}$)
18. $\frac{1}{3} + \frac{1}{4} + \frac{1}{12} = ?$ ($\frac{1}{3} = \frac{4}{12}$. $\frac{1}{4} = \frac{3}{12}$)
19. $\frac{1}{2} + \frac{1}{3} + \frac{1}{4} = ?$ ($\frac{1}{2} = \frac{6}{12}$, etc.)
20. $\frac{1}{2} + \frac{1}{4} + \frac{1}{5} = ?$ ($\frac{1}{2} = \frac{5}{10}$, etc.)
21. From the sum of $\frac{1}{3}$ and $\frac{1}{2}$, take $\frac{1}{6}$.
22. From the sum of $\frac{1}{4}$ and $\frac{1}{5}$, take $\frac{1}{3}$.

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$275\frac{1}{2}$	946	345 †	$2)846\frac{1}{7}$
$124\frac{1}{4}$	$272\frac{3}{7}$	$2\frac{1}{5}$	
$76\frac{3}{8}$			

* $2 = \frac{14}{7}$; 3 sevenths are contained in 14 sevenths $4\frac{2}{3}$ times.
† 2 times 345, plus $\frac{1}{5}$ of 345.

Miscellaneous Problems in Fractions.

1. 3 inches are contained in 7 inches ——— and ——— ———times.

$6 \div 3 =$ $7 \div 3 =$ $8 \div 3 =$

2. 3 tenths are contained in 7 tenths ————.

$.6 \div .3 =$ $.7 \div .3 =$ $.8 \div .3 =$

3. 3 fourteenths are contained in 7 fourteenths ————.

$\frac{6}{14} \div \frac{3}{14} =$ $\frac{7}{14} \div \frac{3}{14} =$ $\frac{8}{14} \div \frac{3}{14} =$

4. 4 inches are contained in 9 inches ——— and ——— times.

$8 \div 4 =$ $9 \div 4 =$ $10 \div 4 =$ $11 \div 4 =$

5. 4 tenths are contained in 9 tenths ————.

$.8 \div .4 =$ $.9 \div .4 =$ $1.0 \div .4 =$ $1.1 \div .4 =$

6. 4 twelfths are contained in 9 twelfths ————.

$\frac{8}{12} \div \frac{4}{12} =$ $\frac{9}{12} \div \frac{4}{12} =$ $\frac{10}{12} \div \frac{4}{12} =$ $\frac{11}{12} \div \frac{4}{12} =$

7. One half of 6 is 1 third of ———.*
8. One third of 6 is 1 half of ———.
9. One fourth of 8 is 1 half of ———.
10. One fourth of 8 is 1 third of ———.
11. One half of 8 is 1 third of ———.
12. One third of 9 is 1 fourth of ———.
13. One fourth of 12 is 1 half of ———.
14. One third of 12 is 1 fourth of ———.
15. One fifth of 15 is 1 third of ———.
16. Two fifths of 15 are 1 fourth of ———.
17. Two fifths of 10 are 1 third of ———.
18. One half of 8 is 2 thirds of ———.
19. One half of 12 is 2 thirds of ———.
20. One half of 3 is 1 third of ———.

* In reading this statement, require the pupil to pause after reading the figure 6 until he can think how many 1 half of 6 is.

Simple Numbers.

See that pupils can read and write all integral numbers that can be represented by four figures.

1. At $23 each, 2 cows cost - - -- dollars.
2. At $25 each, 10 cows cost —— dollars.
3. At $23 each, 10 cows cost · · dollars.
4. At $27 each, 10 cows cost – · – dollars.
5. At $23 each, 20 cows cost —— dollars.*
6. At $24 each, 20 cows cost —— dollars.*
7. At $25 each, 20 cows cost —— dollars.*
8. At $23 each, 22 cows cost —— dollars.†
9. At $25 each, 23 cows cost · – dollars.
10. At $27 each, 21 cows cost —— dollars.
11. At $24 each, 24 cows cost —— dollars.

(a)

45
23
---
135 (3 times 45.)
90 (20 times 45.)

1035 (23 times 45.)

(b) Multiply 48 by 24.

(c) Multiply 37 by 46.

(d) Multiply 58 by 35.

(e) Multiply 72 by 21.

(f) Multiply 86 by 24.

(g)

46½
23

11½ (23 times ½.)
138 (3 times 46.)
92 (20 times 46.)

1069½ (23 times 46½.)

(h)

46.5
23 ‡

139.5 (3 times 46.5.)
930. (20 times 46.5.)

1069.5 (23 times 46 5.)

(i) Multiply 47½ by 25.

(j) 47.5 by 25.

(k) Multiply 38½ by 23.

(l) 38.5 by 23.

* First find the cost of 10 cows, then the cost of 20 cows.

† Find the cost of 20 cows, to which add the cost of 2 cows. After the pupil has solved the problem "mentally," require him to multiply $23 by 22, using a pencil.

‡ Require the pupil to say, "3 times .5 are 15 tenths = one and 5 tenths." *Immediately after writing the figure 5 in the first partial product, the pupil should place the decimal point.*

Denominate Numbers.*

1. I can reduce (change) 6 quarts 1 pint to pints.
6 qt. 1 pt. = ——— pints.

(a) Reduce 36 qt. 1 pt. to pints.†

2. I can reduce 3 gal. 2 qt. to quarts. 3 gal. 2 qt. = ——— quarts.

(b) Reduce 36 gal. 2 qt. to quarts.

3. I can reduce 2 ft. 5 in. to inches. 2 ft. 5 in. = ——— inches.

(c) Reduce 23 ft. 5 in. to inches.

4. I can reduce (change) 15 pints to quarts. 15 pints =

(d) Reduce 85 pints to quarts. 2)85

5. I can reduce 15 quarts to gallons. 15 qt. =

(e) Reduce 177 quarts to gallons. 4)177

6. I can reduce 21 pecks to bushels. 21 pk. =

(f) Reduce 230 pecks to bushels. 4)230

7. I can reduce 18 days to weeks. 18 days =

(g) Reduce 365 days to weeks.

8. I can reduce 2 hours 20 minutes to minutes.
2 hours 20 minutes = ——— minutes.

(h) Reduce 7 hours 20 minutes to minutes.

* Tell the pupil that reduction in Arithmetic is the changing of the denomination of numbers without changing their value.

† In the problem preceding this, the pupil will, without suggestion from the teacher, think somewhat as follows: 6 times 2 pt. = 12 pt.; 12 pt. and 1 pt. = 13 pt. Require him at first to think in a similar manner in the solution of problem (a). If, at length, he shall discover that it is easier to find 2 times 36 than it is to find 36 times 2, and that the numerical result is the same, he may be allowed to use the shorter process. He may be led to think as follows: There are two times as many pints as quarts; if there are 36 quarts, there are two times 36 pints.

2 pt. in 1 quart.
36
72 pt. in 6 quarts.
60 pints in 30 quarts.
73 pt. in 36 quarts.
1 pt.
73 pt. in 36 quarts 1 pt.

Measurements.

Review pp. 73, 83, 93, 103, 113, 123, 133 and 143. Show by a drawing or by paper folding that there are 144 square inches in a square foot. Remind the pupil that the terms *square inch* and *square foot* are applied not only to squares of the corresponding dimensions, but *to their equivalents;* thus, an oblong ½ inch by 6 inches is said to contain 3 square inches; the area of an oblong 2 ft. long and ½ ft. wide is 1 sq. ft. Teach the pupil that an oblong is a rectangle and that a square is a rectangle.

1. A rectangle 1 inch wide and 1 foot long contains ——— square inches.
2. A rectangle 2 inches wide and 1 foot long contains ——— square inches.
3. A rectangle 3 inches wide and 1 foot long contains ——— square inches.
4. A rectangle 8 inches wide and 1 foot long contains ——— square inches.
5. A 12-inch square contains ——— square inches.
6. A 12-inch square is sometimes called a square ———.
7. An oblong 2 feet by 3 feet contains ——— square feet.
8. An oblong 1 foot by 5 feet contains ——— square feet.
9. A square foot is what part of a 2-foot square?
10. 2 square feet are what part of a 2-foot square?
11. 3 square feet are what part of a 2-foot square?
12. 12 square inches are what part of a square foot?
13. 24 square inches are what part of a square foot?
14. An oblong 3 inches wide and 1 foot long is ——— ——— of a square foot.
15. An oblong 4 inches wide and 1 foot long is ——— ——— of a square foot.
16. An oblong 6 inches wide and 1 foot long is ——— ——— of a square foot.
17. An oblong 9 inches wide and 1 foot long is ——— ——— of a square foot.
18. An oblong 11 inches wide and 1 foot long is ——— ——— of a square foot.
19. The area of a rectangular figure 1 in. wide and 6 ft. long is ——— ——— of a square foot.

Measurements.

Teach the meaning and use of the term *square yard.* Show by a diagram that there are 9 square feet in a square yard.

1. A rectangle 1 ft. wide and 1 yd. long contains —— square feet.
2. An oblong 2 ft. wide and 1 yard long contains —— square feet.
3. A 3-foot square contains —— square feet.
4. A 3-foot square is sometimes called a square ——.
5. An oblong 1 yd. by 3 yd. contains —— square yards.
6. An oblong 2 yd. by 3 yd. contains —— square yards.
7. A square foot is —— —— of a square yard.
8. Two square feet are —— —— of a square yard.
9. Three square feet are —— —— of a square yard.
10. Six square feet are —— —— of a square yard.
11. A 2-foot square is —— —— of a square yard.
12. A 2-inch square is —— —— of a 3-inch square.
13. A 2-inch square is —— —— of a 4-inch square.
14. A 1-inch square is —— —— of a 2-inch square.
15. A 1-inch square is —— —— of a 3-inch square.
16. A 1-inch square is —— —— of a 4-inch square.
17. The area of an oblong 1 foot wide and 5 feet long is —— —— of a square yard.

(a)* How many square feet of surface has a blackboard that is 27 feet long and 4 feet wide? How many square yards?

(b) How many square inches in 5 square feet?

(c) How many square yards in 117 square feet?

(d) How many square inches in 1 square yard?

(e) How many square inches in $2\frac{1}{2}$ square feet?

(f) How many square inches in $3\frac{1}{2}$ square feet?

* The area mentioned in each of these questions should be indicated on the floor or blackboard *before* the solution of the problem is attempted.

Ratio and Proportion.

Lead the pupil to make use of the fact that in a proportion the ratios are equal. The terms *proportion* and *ratio*, need not be employed, but the child can readily understand that 8 apples are 2 times 4 apples, and that 6¢ (the cost of 8 apples) are 2 times 3¢ (the cost of 4 apples); that two men are one third as many men as 6 men, and that the work done by two men should be one third as much as the work done by 6 men.

1. Four is —— —— of 8. 8 is —— times 4.
2. Four is —— —— of 12. 12 is —— times 4.
3. Five is —— —— of 20. 20 is —— times 5.
4. Three is —— —— of 12. 12 is —— times 3.

5. If 25¢ pays for 7 lemons, 50¢ pays for ————.
6. If 10¢ pays for 3 oranges, 30¢ pays for ————.
7. If $20 pays for 3 tons, $80 pays for ————.
8. If $5 pays for 3 yards, $25 pays for ————.
9. If 10¢ pays for 3 quarts, 60¢ pays for ————.

10. If 50¢ pays for 4 gallons, 25¢ pays for ————.
11. If 80¢ pays for 12 tickets, 20¢ pays for ————.
12. If 75¢ pays for 9 rides, 25¢ pays for ————.
13. If $40 pays for 7 tons, $20 pays for ————.
14. If $20 pays for 32 bushels, $5 pays for ————.
15. Mary has 10¢; Jane has 20¢; if Mary can buy 3 pencils, Jane can buy —— pencils.
16. Harry has 50¢; Alice has 25¢; if Harry can buy 6 tablets, Alice can buy —— tablets.
17. Fred has 20¢; Samuel has 60¢; if Fred can buy 3 fishing lines, Samuel can buy —— ——.
18. Ned carries coal for 2 stoves; James carries coal for 4 stoves; if the stoves consume like amounts, and if Ned carries 7 hods of coal each day, James must carry ————.
19. If 7 horses consume 2 bushels of oats in a day, 21 horses will consume —— bushels.

Ratio and Proportion.

1. Twelve oranges are worth —— times as much as 6 oranges. If 6 oranges are worth 11¢, 12 oranges are worth —— cents.

2. Six "readers" are worth —— times as much as 2 "readers." If 2 "readers" are worth $1.20, 6 "readers" are worth ————.

3. Five dozen eggs are worth —— —— as much as 10 dozen eggs. If 10 dozen are worth $2.20, 5 dozen are worth ————.

4. Five yards of velvet are worth —— —— as much as 15 yards of velvet. If 15 yards are worth $12, 5 yards are worth —— dollars.

5. If 6 oranges are worth 9¢, 2 oranges are worth —— cents.

6. If 25 railroad tickets cost $10, at the same rate 5 tickets cost —— dollars.

7. If 3 yards of carpet cost $4, at the same rate 15 yards cost —— dollars.

8. If 10 lbs. of sugar are worth 45¢, 2 lbs. are worth —— cents.

9. If 3 tons of coal are worth $20, 6 tons are worth —— dollars.

10. John earns $7 in 2 weeks; in 6 weeks he earns —— dollars.

11. If 3 acres of land yield 5 tons of hay, at the same rate 9 acres will yield —— tons.

12. If 20 lbs. of salt cost 12¢, at the same rate 40 lbs. will cost —— cents.

13. If 5 yards of ribbon cost $\frac{1}{4}$ of a dollar, at the same rate 15 yards will cost —— —— of a dollar.

Review Problems.

ADDITION.*

(a)	(b)	(c)	(d)	(e)
$346\frac{1}{8}$	$237\frac{1}{2}$	$46\frac{1}{8}$	436.3	376.4
$155\frac{1}{4}$	$26\frac{1}{8}$	$275\frac{1}{2}$	74.2	538.2
$276\frac{5}{7}$	$275\frac{3}{4}$	143.3	235.7	624.7

(f) Add four hundred forty-six and one half, and two hundred three and one seventh.

SUBTRACTION.*

(g)	(h)	(i)	(j)	(k)
$346\frac{5}{8}$	$504\frac{7}{12}$	$840\frac{5}{6}$	$725\frac{3}{8}$	738.2
$128\frac{1}{4}$	$182\frac{1}{2}$	$138\frac{1}{8}$	$142\frac{1}{2}$	146.5

(l) From one hundred sixty-four and one fifth, take eighty-one and one tenth.

MULTIPLICATION.*

(m)	(n)	(o)	(p)	(q)
$374\frac{1}{2}$	$203\frac{1}{2}$	123	305.2	254
7	9	$23\frac{1}{2}$	6	3.4

(r) Multiply two hundred five by four and one fifth.

DIVISION.*

(s)	(t)	(u)	(v)	(w)
$3\frac{1}{2})49$†	$4\frac{1}{2})180$	$2\frac{1}{2})175$	$1\frac{1}{2})432$	$2)385\frac{1}{4}$

(x) Divide twenty-five by two and one half.

* Require pupils to use the numbers as they appear upon this page in concrete problems until they are thoroughly familiar with the meaning of each problem given. Thus, for problem (t) the pupil may say: "A man paid $180 for coal at $4\frac{1}{2}$ per ton; he bought 40 tons.

†$3\frac{1}{2})49$ Change $3\frac{1}{2}$ and 49 to halves. $3\frac{1}{2} = 7$ halves. $49 = 98$ halves. 7 halves
$7)\overline{98}$ are contained in 98 halves 14 times. So $3\frac{1}{2}$ is contained in 49 fourteen
$\overline{14}$ times. Tell a suggested number story.

Common Fractions.

thirds fifths fifteenths

1. One third is ——— fifteenths.
2. One fifth is ——— fifteenths.
3. Two fifths are ——— fifteenths.
4. Three fifths are ——— fifteenths.
5. One third and 1 fifteenth are ————.
6. One third less 1 fifteenth are ————.
7. Two fifths and 1 fifteenth are ————.
8. Two fifths less 1 fifteenth are ————.
9. Three fifths and 2 fifteenths are ————.
10. Three fifths less 2 fifteenths are ————.

11. $\frac{1}{3} + \frac{7}{15}$, means ————. $\frac{1}{3} + \frac{7}{15} =$
12. $\frac{2}{3} - \frac{7}{15}$, means ————. $\frac{2}{3} - \frac{7}{15} =$
13. $\frac{3}{5} \times 8$, means ————. 8 times $\frac{3}{5} =$
14. $10 \times \frac{3}{5}$, means, ————. * $\frac{3}{5}$ of 10 =
15. $10 \times 2\frac{3}{5}$, means ————. * $2\frac{3}{5}$ times 10 =
16. $\frac{3}{5} \div \frac{1}{15}$, means ————. * $\frac{1}{15}$ is ————.
17. $3 \div \frac{3}{5}$, means ————. * $\frac{3}{5}$ are ————.
18. $\frac{3}{5} \div 3$, means ————. * $\frac{1}{3}$ of $\frac{3}{5} =$

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$246\frac{1}{3}$	$374\frac{2}{3}$	$256\frac{2}{3}$	$5)565\frac{1}{3}$
$75\frac{1}{3}$	$146\frac{1}{3}$	5	

(a) Tell the meaning. (b) Copy and complete. (c) Tell the suggested number stories.

(e) 8 gallons)336 gallons.

(f) 8)336 gallons.

(g) 3 feet)432 feet.

(h) 3)432 feet.

* See foot-notes, page 175.

Common Fractions.

1. Add $\frac{3}{5}$ and $\frac{1}{5}$. ($\frac{3}{5} = \frac{12}{20}$. $\frac{1}{5} = \frac{12}{20}$.)
2. Add $\frac{5}{8}$ and $\frac{7}{16}$. (Change $\frac{5}{8}$ to $\frac{12}{16}$.)
3. From $\frac{1}{2}$ subtract $\frac{1}{5}$. ($\frac{1}{2} = \frac{12}{20}$. $\frac{1}{5} = \frac{12}{20}$.)
4. From $\frac{9}{14}$ subtract $\frac{1}{7}$. (Change $\frac{1}{7}$ to —.)
5. Multiply 8 by $3\frac{3}{4}$. (3 times 8, plus $\frac{3}{4}$ of 8.)
6. Multiply $5\frac{1}{3}$ by 6. (6 times $\frac{1}{3}$, plus 6 times 5.)
7. Divide $\frac{3}{5}$ by 5. (Find 1 fifth of $\frac{3}{5}$.)
8. Divide 5 by $\frac{3}{5}$. (Find how many times, etc.)
9. Find the sum of 3.2 and $1\frac{3}{5}$. ($\frac{3}{5} = \frac{12}{20}$.)
10. Find the sum of $2\frac{1}{5}$ and $2\frac{7}{16}$. ($\frac{1}{5} = \frac{12}{16}$.)
11. Find the difference of $5\frac{3}{5}$ and 1.2.
12. Find the difference of $4\frac{1}{2}$ and $2\frac{1}{16}$.
13. Find the product of 10 multiplied by $3\frac{2}{5}$.
14. Find the product of $3\frac{2}{5}$ multiplied by 10.
15. Find the quotient of $\frac{4}{5}$ divided by 3.
16. Find the quotient of 3 divided by $\frac{4}{5}$*.
17. $\frac{1}{8} + \frac{1}{5} + \frac{1}{16} = ?$ ($\frac{1}{8} = \frac{12}{16}$. $\frac{1}{5} = \frac{12}{16}$.)
18. $\frac{1}{2} + \frac{1}{7} + \frac{1}{14} = ?$ ($\frac{1}{2} = \frac{12}{14}$. $\frac{1}{7} = \frac{12}{14}$.)
19. $\frac{1}{2} + \frac{1}{5} + \frac{1}{10} = ?$ ($\frac{1}{2} = \frac{12}{20}$. $\frac{1}{5} = \frac{12}{20}$.)
20. $\frac{2}{3} + \frac{2}{5} + \frac{1}{15} = ?$ ($\frac{2}{3} = \frac{12}{15}$. $\frac{2}{5} = \frac{12}{15}$.)

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$254\frac{1}{8}$	874	556	5)647
$75\frac{1}{5}$	$142\frac{7}{16}$	$3\frac{1}{5}$	
$106\frac{2}{16}$			

* $3 = \frac{15}{5}$; 4 fifths are contained in 15 fifths ——— and ——— ——— times. See first six problems on page 177.

Miscellaneous Problems in Fractions.

1. $\$2\frac{1}{5} + \$3\frac{1}{10} =$	$\$2.2 + \$3.1 =$
2. $\$6 - \$2\frac{1}{5} =$	$\$6 - \$2.2 =$
3. $\$\frac{2}{5} \times 3 =$	$\$.4 \times 3 =$
4. $\$10 \times \frac{2}{5} =$*	$\$10 \times .4 =$*
5. $\$20 \times 2\frac{1}{2} =$*	$\$20 \times 2.5 =$*
6. $\$\frac{1}{2} \times \frac{1}{5} =$*	$\$12 \times .1 =$*
7. $\$\frac{1}{5} \div \$\frac{1}{10} =$†	$\$50 \div \$.5 =$†
8. $\$2 \div \$\frac{1}{5} =$†	$\$2 \div \$.2 =$†
9. $\$\frac{4}{5} \div 2 =$ ‡	$\$.8 \div 2 =$‡

10. James can saw $\frac{1}{2}$ of a cord of wood in a day; in 9 days he can saw ——— cords. $\frac{1}{2} \times 9 =$

11. When potatoes are worth $\frac{1}{2}$ a dollar a bushel, for $9 I can buy ——— bushels. $\$9 \div \$\frac{1}{2} =$

12. Henry earns $5 a week; in 2 weeks he earns ——— dollars; in 3 weeks he earns ——— dollars; in $3\frac{1}{2}$ weeks he earns ——— dollars. $\$5 \times 3\frac{1}{2} =$

13. If ribbon is worth $\$\frac{3}{4}$ a yard, for $1 I can buy ——— and ——— ——— yards. $1 \div \frac{3}{4} =$ $2 \div \frac{3}{4} =$

14. If a yard of ribbon is worth $\frac{3}{5}$ of a dollar, $\frac{1}{2}$ of a yard is worth ——— ——— of a dollar. $\frac{1}{2}$ of $\$\frac{3}{5} =$

15. Peter earns $\$\frac{3}{4}$ a day; in 3 days he earns ——— fourths dollars or ——— and ——— ——— dollars. $\$\frac{3}{4} \times 3 =$

16. Arthur earned $10 in 4 days; in one day he earned ——— and ——— ——— dollars. $\$10 \div 4 =$

17. Richard earns $\$\frac{3}{4}$ in 2 hours; in one hour he earns ——— ——— of a dollar; in 3 hours he earns ——— eighths dollars or ———. $\$\frac{3}{4} \div 2 =$ $\$\frac{3}{8} \times 3 =$

* What does the expression mean? See page 114.

† This means, *find how many times, etc.*

‡ This means, *find one half of* ———.

Simple Numbers.

Teach the meaning and use of the terms *minuend* and *subtrahend*. Show that the minuend, the subtrahend, and the difference are like numbers. Show that the minuend is the sum of the subtrahend and the difference.

(a)	(b)	(c)	(d)
12 dollars	15 oranges	25¢	275
5 dollars	6 oranges	8¢	146
7 dollars	9 oranges	17¢	129

1. In problem (a) the minuend is ——; the subtrahend is ——; the difference is ——.

2. In problem (b) the subtrahend is ——; the minuend is ——; the difference is —.

3. In problem (c) the difference is ——; the minuend is ——; the subtrahend is .

4. In problem (d) the minuend is ——; the difference is ——; the subtrahend is ——.

5. In a problem the minuend is 8 dollars; the subtrahend is 5 dollars ——; the difference is —— ——.

6. When the difference is 5 inches and the subtrahend is 4 inches, the minuend is —— ——.

7. When the difference is 11 feet and the minuend is 14 feet ——, the subtrahend is —— ——.

8. The sum of two numbers is 15; one of the numbers is 6; the other number is ——.

9. The difference of two numbers is 9; the larger number is 20; the smaller number is ——.

10. The difference of two numbers is 9; the smaller number is 21; the larger number is ——.

11. From $\frac{2}{3}$ of 33 subtract $\frac{1}{4}$ of 32.

12. Minuend, .47; subtrahend, .2; difference, ——.

Denominate Numbers.

1. 2 gal. 1 qt. + 3 gal. 2 qt. are ————.*

(a) Add 47 gal. 1 qt. and 35 gal. 2 qt.

2. 2 bu. 3 pk. + 3 bu. 3 pk. are ————.*

(b) Add 54 bu. 3 pk. and 29 bu. 3 pk.

3. 6 gal. 3 qt. − 3 gal. 1 qt. are ————.*

(c) From 45 gal. 3 qt. subtract 37 gal. 1 qt.

4. 4 gal. 1 qt. − 1 gal. 3 qt. are ————.*

(d) From 57 gal. 1 qt. subtract 24 gal. 3 qt.

5. 3 bu. 2 pk. × 4 equals ————.*

(e) Multiply 27 bu. 2 pk. by 6. (f) 36 bu. 3 pk. × 7 =

6. 3 bu. 2 pk. ÷ 2 pk. equals ————.†

7. 4 bu. 2 pk. ÷ 2 equals ————.*

(g) Divide 84 gal. 2 qt. by 2. (h) 96 gal. 3 qt. ÷ 3 =

8. 5 bu. 2 pk. ÷ 2 equals ————.*

(i) Divide 35 bu. 2 pk. by 2. (j) 46 bu. 2 pk. ÷ 3 =

9. Six yards 2 feet equal —— feet.

(k) Reduce 45 yards 1 foot to feet. (l) 58 yd. 2 ft. =

10. Two pecks 3 quarts equal —— quarts.

(m) Reduce 23 pecks 3 quarts to quarts. (n) 43 pk. 1 qt. =

11. Twenty-seven feet equal —— yards.

(o) Reduce 56 feet to yards. (p) 97 feet =

12. Twenty-five quarts equal —— pecks.

(q) Reduce 125 quarts to pecks. (r) 225 quarts =

* After this has been solved "mentally," show how it would appear upon the blackboard as a problem in denominate numbers.

† 3 bu. 2 pk. = 14 pk; 2 pk. are contained in 14 pk. —— times.

Measurements.

Be sure that the pupil understands that by the expression *square inch*, we mean the equivalent of a 1-inch square. Then by paper cutting lead him to discover that the area of a piece of paper ½ in. by 2 in. is 1 square inch; that the area of a piece of paper ¼ in. by 4 in. is 1 square inch, etc. Remind the pupil that a rectangle may be either a square or an oblong.

1. The area of a rectangle 1 inch wide and 6 in. long is —— square inches. The area of a rectangle ½ of an inch wide and 6 in. long is —— square inches.

2. The area of a rectangle 1 inch wide and 8 in. long is —— square inches. The area of a rectangle ¼ of an inch wide and 8 in. long is —— square inches.

3. The area of a rectangle 1 in. wide and 5 in. long is —— square inches. The area of a rectangle ½ of an inch wide and 5 in. long is —— square inches.

4. The area of an oblong 2 in. wide and 6 in. long is —— square inches. The area of an oblong 2½ in. wide and 6 in. long is —— square inches.*

5. The area of an oblong 4 inches wide and 6 in. long is —— square inches. The area of an oblong 4 inches wide and 6½ in. long is —— square inches.

6. The area of an oblong 4 in. wide and 8 in. long is —— square inches. The area of an oblong 4 in. wide and 8¼ inches long is —— square inches. The area of an oblong 4¼ in. wide and 8 in. long is —— square inches.

* Have an oblong drawn that is 2 in. by 6 in. Lead the pupil to see how much the figure will be enlarged by making it ½ an inch wider.

Measurements.

Draw, or require the pupil to draw, until you have evidence that the pupil can imagine the figure without drawing it; then *do not draw nor allow the pupil to draw.*

1. The area of an oblong 1 ft. wide and 6 ft. long is —— square feet. The area of an oblong $\frac{1}{2}$ of a foot wide and 6 ft. long is —— square feet.

2. The area of an oblong 1 ft. wide and 8 ft. long is —— square feet. The area of an oblong $\frac{1}{4}$ of a foot wide and 8 ft. long is —— square feet.

3. The area of an oblong 1 ft. wide and 5 feet long is —— square feet. The area of an oblong $\frac{1}{2}$ of a foot wide and 5 feet long is —— square feet.

4. The area of an oblong 2 feet wide and 6 feet long is —— square feet. The area of an oblong $2\frac{1}{2}$ ft. wide and 6 ft. long is —— square feet.

5. The area of an oblong 4 ft. wide and 6 ft. long is —— square feet. The area of an oblong 4 feet wide and $6\frac{1}{2}$ feet long is —— square feet.

6. The area of an oblong 4 feet wide and 8 feet long is —— square feet. The area of an oblong 4 ft. wide and $8\frac{1}{4}$ ft. long is —— square feet. The area of an oblong $4\frac{1}{4}$ ft. wide and 8 ft. long is —— square feet.

7. A $\frac{1}{2}$-foot square is —— —— of a square foot.

8. Draw upon the blackboard very carefully a $2\frac{1}{2}$-foot square. Try to divide it so that you can see how many square feet it contains.

9. Draw upon the blackboard very carefully a $1\frac{1}{2}$-foot square. Try to divide it so that you can see how many square feet it contains.

10. In a $3\frac{1}{2}$-foot square there are —— square feet.

11. In a $4\frac{1}{2}$-foot square there are —— square feet.

Ratio and Proportion.

Review the first part of page 182. Read the first set of problems on this page, thus: 4 is $\frac{2}{3}$ of 6. 6 is $\frac{3}{2}$ of 4, or $1\frac{1}{2}$ times 4. Tell the pupil that $\frac{3}{2}$ of 4, means, *3 times $\frac{1}{2}$ of 4*. Such expressions as $\frac{3}{2}$ of 4 are used by the author of this book advisedly. The expression is a convenient idiom found in nearly all elementary arithmetics, and certain to be met with in the higher mathematics. Moreover, familiarity with the meaning of this expression seems a necessary preparation for a clear understanding of some of the expressions of percentage, thus: A man sold goods so as to gain 150 %. 150 % of what? Of the cost; $\frac{150}{100}$, or $\frac{3}{2}$ of the cost.

4 is —— —— of 6.	6 is —— —— of 4, or —— times 4.
6 is —— —— of 9.	9 is —— —— of 6, or —— times 6.
8 is —— —— of 12.	12 is —— —— of 8, or —— times 8.
10 is —— —— of 15.	15 is —— —— of 10, or —— times 10.
12 is —— —— of 18.	18 is —— —— of 12, or —— times 12.
14 is —— —— of 21.	21 is —— —— of 14, or —— times 14.
20 is —— —— of 30.	30 is —— —— of 20, or —— times 20.

1. 20¢ pays for 6 lemons; 30¢ pays for ————.
2. 10¢ pays for 4 oranges; 15¢ pays for ————.
3. 5¢ pays for 3 apples; 15¢ pays for ————.
4. 6¢ pays for 5 eggs; 18¢ pays for ————.
5. $4 pays for 12 yards; $6 pays for ————.
6. 75¢ pays for 9 yards; 25¢ pays for ————.
7. 15¢ pays for 6 bananas; 10¢ pays for ————.
8. $40 pays for 12 tons; $10 pays for ————.
9. $30 pays for 9 tickets; $20 pays for ————.
10. 50¢ pays for 15 yards; 10¢ pays for ————.

11. Susan has 10¢; Jane has 15¢; if Susan can buy 4 pencils, Jane can buy —— pencils.

12. Henry has 20¢; William has 30¢; if Henry can buy 8 tablets, William can buy —— tablets.

13. If 4 horses consume 10 pecks of oats in a day, 6 horses will consume —— pecks.

Ratio and Proportion.

1. Twelve oranges are worth —— times as much as 8 oranges. If 8 oranges are worth 14¢, 12 oranges are worth —— cents.

2. Fifteen dozen eggs are worth —— times as much as 10 dozen eggs. If 10 dozen eggs are worth $1.20, 15 dozen are worth ——.

3. Eight ponies consume —— —— as many oats in a day as 12 ponies. If 12 ponies consume 60 qt., 8 ponies consume —— quarts.

4. A man can earn —— times as much money in 6 days as he can earn in 2 days. If he earns $5 in 2 days, in 6 days he earns —— dollars.

5. If 10 lbs. of sugar are worth 40¢, 15 lbs. are worth —— cents.

6. If 4 acres of land yield 6 tons of hay, at the same rate 6 acres yield —— tons.

7. If 10 railroad tickets cost $4, at the same rate 15 tickets cost —— dollars.

8. 1½ times 4 = ——. 1½ times 5 = ——.

9. 1½ times 6 = ——. 1½ times 7 = ——.

10. 1½ times 9 = ——. 1½ times 11 = ——.

11. If 4 bushels of beans are worth $7, 6 bushels are worth ——.

12. If 6 bags of corn are worth $5, 9 bags of corn are worth ——.

13. If 8 yards of velvet are worth $11, 12 yards are worth ——.

14. If 12 bu. of potatoes are sufficient for a family for 4 months, 18 bu. are sufficient for the same family for —— months.

15. If 5 bu. of oats will feed 20 horses, 7½ bu. will feed —— horses.

Review Problems.*

ADDITION.

(a)	(b)	(c)	(d)	(e)
$243\frac{1}{5}$	$554\frac{3}{7}$	352.2	575.2	34.7
36	132	53	147	86.4
$154\frac{2}{3}$	$65\frac{1}{2}$	128.3	$24\frac{1}{5}$	95.7
75	325	57	36	28.5

(f) Add two hundred seventy-five and three eighths, and one hundred thirty-seven and one fourth.

SUBTRACTION.

(g)	(h)	(i)	(j)	(k)
$374\frac{1}{3}$	496	528.3	624.5	38.7
$138\frac{1}{8}$	$73\frac{4}{7}$	141.2	$138\frac{1}{8}$	15.9

(l) From eight hundred forty-four, take two hundred seventy-one and three fifths.

MULTIPLICATION.

(m)	(n)	(o)	(p)	(q)
$246\frac{8}{15}$	348	425	378.4	436
2	$5\frac{1}{2}$	$22\frac{1}{8}$	6	3.5

(r) Multiply three hundred four and three fifths by four.

DIVISION.

(s)	(t)	(u)	(v)	(w)
$3\frac{1}{2})98$ *	$\$.2)\$24.8$	$2)\$24.8$	$4)58.4$	$3(244\frac{1}{4}$

(x) Divide four hundred fifty-six by three.

* See foot-note, page 184. Tell the meaning. Tell the suggested number story.

Decimals—Hundredths.

Teach the pupil to write hundredths decimally; as, twenty-four dredths (.24), eight hundredths (.08), two hundred twenty-five hunhundredths (2.25).

Teach the pupil to read such expressions as 2.25 in two ways; thus, (a) *two and twenty-five hundredths;* (b) *two hundred twenty-five hundredths.* Also lead the pupil to perceive that this expression 2.25, stands for a number that is made up of 2 wholes, 2 tenths, and 5 hundredths. Review page 155.

1. 24¢ and 8¢ are —— cents.
2. .24 and .08 are —— hundredths.

3. 24¢ less 8¢ are —— cents.
4. .24 less .08 are —— hundredths.

5. 24¢ × 2, means, *2 times 24¢*; 2 times 24¢ =
6. .24 × 2, means, *2 times .24*; 2 times .24 =

7. 24¢ ÷ 4¢, means, *find how many times 4¢ are contained in 24¢*; 4¢ are contained in 24¢ —— times.
8. .24 ÷ .04, means, *find how many times .04 are contained in .24;* .04 are contained in .24 —— times.

9. 24¢ ÷ 4, means, *find one fourth of 24¢*; one fourth of 24¢ is —— cents.
10. .24 ÷ 4, means, *find one fourth of .24;* one fourth of .24 is —— hundredths.

11. Can you add 24¢ and 3 dimes? Yes, I can do it in two ways: 3 dimes = —— cents; 24¢ + 30¢ = ——¢.
24¢ = 2 dimes and 4¢; 2 dimes and 4¢ + 3 dimes =

12. Can you add .24 and .3? Yes, I can do it in two ways: .3 = —— hundredths; .24 + .30 = —— hundredths. .24 = .2 and .04; .2 and .04 + .3 are ——.

Read and complete; then copy and complete, using figures.

.35 + .02 =	.35 − .02 =	.35 + .2 =	.35 − .2 =
.12 × 2 =	.12 ÷ .02 =	.12 ÷ 2 =	.04 × 2 =

Decimals—Hundredths.

Teach the pupil to read in the several ways indicated, and to write such expressions as the following: \$.24 = 24¢ = 24 hundredths of a dollar = 24 hundredth-dollars = 2 dimes and 4¢ = 2 tenths and 4 hundredths of a dollar; \$1.25 = 1 dollar and 25¢ = 1 and 25 hundredths dollars = 125 hundredth-dollars = 1 dollar, 2 dimes, and 5¢ = 1 dollar, 2 tenth-dollars, and 5 hundredth-dollars.

1. One hundredth of a dollar is —— cent. \$.03 =
2. Six hundredths of a dollar = —— cents. \$.09 =
3. 53 hundredths of a dollar = —— cents. \$.75 =
4. 46 hundredths of a dollar = —— dimes and —— cents.
5. 46 hundredths = —— tenths and —— hundredths.
6. 52 hundredths = —— tenths and —— hundredths.
7. 78 hundredths = —— tenths and —— hundredths.
8. \$.45 = —— tenths and —— hundredths of a dollar.
9. \$.36 = —— tenths and —— hundredths of a dollar.
10. One half-dollar = —— hundredths of a dollar.
11. One fourth-dollar = —— hundredths of a dollar.
12. Three fourth-dollars = —— hundredths of a dollar.
13. Mary had \$.08 in her pocket and \$.52 in her bank; in both she had ——.
14. Jane had \$.48; she spent \$.11; she then had ——.
15. Sarah paid \$.25 for each of 3 books; for all she paid ——.
16. Alice had \$.50 with which to buy tea at \$.25 a pound; she could buy ——.
17. Maude paid \$.80 for 4 pounds of coffee; one pound cost ——.

(a) Tell the meaning, (b) copy and complete, and (c) tell suggested number stories.

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.	(e) Divide.
\$1.25	\$6.14	\$6.15	\$.05)\$1.25	5)\$1.25
\$4.08	\$2.18	3		

Decimals—Hundredths.

1. .28 + .06. (To be read, 28 hundredths plus 6 hundredths.)
(a) .28 + .06, means, .28 *and* .06; (b) .28 and .06 are ——— ———. (c) Arthur earned .28 of a dollar Monday and .06 of a dollar Tuesday; in both days he earned ———.

2. .32 − .06. (To be read, 32 hundredths minus 6 hundredths.)
(a) .32 − .06, means, .32 *less* .06; (b) .32 less .06 are ——— ———. (c) Harry had .32 of a dollar; he spent .06 of a dollar; he then had ———.

3. .06 × 4. (To be read, 6 hundredths multiplied by 4.)
(a) .06 × 4, means, *4 times .06;* (b) 4 times .06 are ——— ———. (c) If 1 yard of ribbon is worth .06 of a dollar, 4 yards are worth ————.

4. .48 ÷ .06. (To be read, 48 hundredths divided by 6 hundredths.)
(a) .48 ÷ .06, means, *find how many times .06 are contained in .48;* (b) .06 are contained in .48 ——— times. (c) James had .48 of a dollar with which to buy tablets at .06 of a dollar each; he could buy ——— tablets.

5. .48 ÷ 6. (To be read, 48 hundredths divided by 6.)
(a) .48 ÷ 6, means, *find 1 sixth of .48*; (b) 1 sixth of .48 is ————. (c) William paid .48 of a dollar for 6 pounds of sugar; one pound cost ————.

Using the above as models, (a) tell the meaning of the following expressions, (b) complete them, and (c) tell suggested number stories; then copy and complete.

.75 + .05 =	.46 + .5 =	.6 + .25 =
.84 − .06 =	.75 − .5 =	.6 − .25 =
.93 × 2 =	.09 × 5 =	.6 × 7 =
.54 ÷ .09 =	.55 ÷ .05 =	.60 ÷ .03 =
.54 ÷ 9 =	.55 ÷ 5 =	.6 ÷ 3 =

Decimals—Hundredths.

Do oral work similar to the following *before* asking the pupil to read this page.

After the answer has been given to any one of the following problems, require a pupil to put it upon the blackboard in the usual form for written work in addition of decimals.

1.	The sum of \$.2 and \$.34 is ——.	.2 + .36 =
2.	The sum of \$.43 and \$.04 is ——.	.43 + .06 =
3.	The sum of \$.30 and \$.06 is ——.	.30 + .04 =
4.	The sum of \$.40 and \$.05 is ——.	.40 + .07 =
5.	The sum of \$.08 and \$.96 is ——.	.08 + .07 =
6.	The sum of \$.25 and \$.06 is ——.	.25 + .08 =
7.	The sum of \$.09 and \$.06 is ——.	.09 + .08 =
8.	The sum of \$.35 and \$.07 is ——.	.35 + .09 =
9.	The sum of \$1.25 and \$1.25 is ——.	1.25 + 1.26 =
10.	The sum of \$1.35 and \$.08 is ——.	1.35 + .06 =
11.	The sum of \$1.45 and \$.4 is ——.	1.45 + .5 =
12.	The sum of \$1.55 and \$.6 is ——.	1.55 + .7 =

The second part of each of the following is to be solved with a pencil:

13. The sum of two tenths and twenty-four hundredths is —— hundredths. (a) \$26.2 + \$84.24 =

14. The sum of eight tenths and six hundredths is —— hundredths. (b) \$47.8 + \$55.06 =

15. The sum of seven hundredths and five hundredths is —— hundredths. (c) \$36.07 + \$45.05 =

16. The sum of fifty hundredths and fifty-five hundredths is —— hundredths. (d) \$64.50 + \$73.55 =

(a) Tell the meaning, (b) copy and complete, and (c) tell suggested number stories.

(e)	(f)	(g)	(h)	(i)
\$24.46	\$55.60	\$7.25	\$.05)\$2.75	5)\$2.75
\$5.4	\$14.38	4		

Decimals—Hundredths.

See suggestions on page 198.

1. The difference of $.45 and $.25 is ———.
2. The difference of $.6 and $.15 is ———.
3. The difference of $.40 and $.05 is ———.
4. The difference of $.45 and $.2 is ———.

5. $2.30 − $1.25 = 2.30 − 1.28 =
6. $3.45 − $1.05 = 3.45 − 1.03 =
7. $4.55 − $2.2 = 4.55 − 2.3 =
8. $5 − $.25 = 5 − .75 =

Write in figures and perform the following:

(a) From 20 dollars and 45 cents, subtract 14 dollars and 22 cents.

(b) From 26 and 45 hundredths, subtract 14 and 24 hundredths.

(c) Add 35 dollars and 45 cents, and 27 dollars and 53 cents.

(d) Add 35 and 24 hundredths, and 27 and 42 hundredths.

(e) From 38 dollars and 52 cents subtract 21 dollars and 27 cents.

(f) From 38 and 52 hundredths subtract 21 and 24 hundredths.

(g) Add twenty-four dollars and forty-two cents, and thirty-three dollars and twenty-seven cents.

(h) Add twenty-four and forty-two hundredths, and thirty-three and twenty-five hundredths.

(i) From eighteen dollars and thirty-six cents, subtract fourteen dollars and twenty-three cents.

(j) From eighteen and thirty-six hundredths, subtract fourteen and twenty-one hundredths.

Decimals—Hundredths.

See suggestions on page 198.

1. The product of $.12 multiplied by 2 =
2. The product of $1.04 multiplied by 5 =
3. The product of $2.25 multiplied by 3 =
4. The product of $1.50 multiplied by 2 =

5. $2.25 × 2 = 1.25 × 3 =*
6. $2.12 × 3 = 2.12 × 4 =*
7. $3.04 × 4 = 3.04 × 5 =*
8. $4.25 × 4 = 4.25 × 5 =*

Write in figures and perform the following:

(a) Multiply 15 dollars and 26 cents by 5.

(b) Multiply 15 and 27 hundredths by 5.

(c) Multiply 24 dollars and 35 cents by 6.

(d) Multiply 24 and 32 hundredths by 6.

(e) Multiply 34 dollars and 3 dimes by 4.

(f) Multiply 34 and 4 tenths by 4.

(g) Multiply twenty-eight dollars and sixteen cents by three.

(h) Multiply twenty-eight and sixteen hundredths by four.

(i) Multiply forty-three dollars and twenty-five cents by four.

(j) Multiply forty-three and twenty-five hundredths by three.

(k) Multiply forty-six and three tenths by seven.

(l) Multiply seventy-five and thirty-two hundredths by eight.

(m) Multiply fifty-four and two hundredths by six.

* Require written solutions of these problems *after* the pupil has solved them "mentally" and given correct answers.

Decimals—Hundredths.

See suggestions on page 198 and foot-note on page 200.

1. The quotient of $.45 divided by $.05 is ———.*
2. The quotient of $.45 divided by 5 is ———.†
3. The quotient of .55 divided by .05 is ———.*
4. The quotient of .55 divided by 5 is ———.†

5.	$.36 ÷ $.09 =	.36 ÷ .04 =
6.	$.36 ÷ 9 =	.36 ÷ 4 =
7.	$.48 ÷ $.06 =	.48 ÷ .04 =
8.	$.48 ÷ 6 =	.48 ÷ 4 =
9.	$.12 ÷ $.02 =	.12 ÷ .03 =
10.	$.12 ÷ 2 =	.12 ÷ 3 =
11.	$1.20 ÷ $.02 =	1.20 ÷ .03 =
12.	$1.20 ÷ 2 =	1.20 ÷ 3 =

Write in figures and perform the following:

(a) Divide 24 dollars and 25 cents by 5¢.*
(b) Divide 24 and 25 hundredths by 5 hundredths.*
(c) Divide 24 dollars and 25 cents by 5.†
(d) Divide 24 and 25 hundredths by 5.†
(e) Divide 37 dollars and 5 cents by 5 cents.*
(f) Divide 37 and 5 hundredths by 5 hundredths.*
(g) Divide 37 dollars and 5 cents by 5.†
(h) Divide 37 and 5 hundredths by 5.†

(a) Tell the meaning, (b) copy and complete, and (c) tell suggested number stories.

(i)	(j)	(k)	(l)	(m)
$13.06	$31.04	$9.05	$.04)$25.24	4)$25.24
$28.27	$8.28	6		

* Lead the pupil to see that he must *find how many times, etc.*
† Lead the pupil to see that he must *find one fifth of* ———.

Decimals—Hundredths.

Review page 162.

After the first six lines have been read, require the pupil to write them in figures, thus: $\frac{1}{2}$ of .24 = .12; .24 is $\frac{1}{2}$ of .48. As a "stepping stone" to the written work that follows, it may be well also to write them thus:

$$\begin{array}{r} 2\overline{).24} \\ \hline .12 \end{array} \qquad \begin{array}{r} .24 \\ 2 \\ \hline .48 \end{array}$$

1. One half of .24 is ——. .24 is $\frac{1}{2}$ of ——.
2. One half of .16 is ——. .16 is $\frac{1}{2}$ of ——.
3. One third of .12 is ——. .12 is $\frac{1}{3}$ of ——.
4. Two thirds of .12 are ——. .12 is $\frac{2}{3}$ of ——.
5. Three fourths of .12 are ——. .12 is $\frac{3}{4}$ of ——.
6. One half of 2.06 is ——. 2.06 is $\frac{1}{2}$ of ——.
7. .08 is what part of .12? .04 of .12?
8. .09 is what part of .12? .06 of .12?
9. .12 is what part of .16? .12 of .18?
10. .12 is what part of .36? .12 of .48?
11. .25 is what part of 1? .75 of 1?
12. One fourth of .2 (.20) is —— hundredths.*
13. Three fourths of .2 (.20) are —— hundredths.
14. One fifth of .2 (.20) is —— hundredths.
15. Three fifths of .2 (.20) are —— hundredths.
16. .04 is —— —— of .2. .05 is —— —— of .2.
17. .08 is —— —— of .2. .12 is —— of .2.
18. .15 is —— —— of .2. .16 is —— —— of .2.

Tell the meaning; then copy and perform.

(a)	(b)	(c)	(d)	(e)
5)$.2	5)$.3	5)$.4	5)$.6	5)$.7
(f)	(g)	(h)	(i)	(j)
5)$2.2	5)$2.3	5)$2.4	5)$2.6	5)$2.7
(k)	(l)	(m)	(n)	(o)
5)$32.2	5)$32.3	5)$32.4	5)$32.6	5)$32.7

* To some pupils it may be necessary to suggest that the .2 *may* be 2 tenths of a dollar—2 dimes—20 cents.

Decimals—Hundredths.

Review page 163. Lead the pupil to perceive that 600 ÷ 100 = 6.00; that 650 ÷ 100 = 6.50; that 655 ÷ 100 = 6.55, etc.

1. One hundredth of 200 is ———. .02 of 200 =
2. One hundredth of 300 is ———. .02 of 300 =
3. One hundredth of 400 is ———. .02 of 400 =
4. One hundredth of 500 is ———. .07 of 500 =

5. Three hundredths of 200 are ———. .04 of 200 =
6. Three hundredths of 300 are ———. .04 of 300 =
7. Three hundredths of 400 are ———. .04 of 400 =
8. Nine hundredths of 300 are ———. .12 of 300 =

9. .01 of 204 is ——— and ——— hundredths. .02 of 204 =
10. .01 of 306 is ——— and ——— hundredths. .02 of 306 =
11. .01 of 225 is ——— and ——— hundredths. .02 of 225 =
12. .01 of 202 = .02 of 202 = .03 of 202 =
13. .01 of 302 = .02 of 302 = .03 of 302 =
14. .01 of 108 = .02 of 108 = .03 of 108 =
15. .01 of 212 = .02 of 212 = .03 of 212 =

See foot-note on page 163.

(a) Multiply $2.46 by 3. (b) 2.48 × 2 =
(c) Multiply $3.65 by 5. (d) 3.65 × 4 =

(e) Divide $3.68 by 2.* (f) 4.38 ÷ 2 =*
(g) Divide $8.49 by 3.* (h) 6.75 ÷ 3 =*

(i) Divide $4.62 by $.02.* (j) 4.72 ÷ .02 = *
(k) Divide $6.93 by $.03.* (l) 3.75 ÷ .03 = *

16. Find 1 hundredth of $2500. .02 of $2500.
17. Find 3 hundredths of $2500. .04 of $2500.
18. Find 5 hundredths of $2500. .06 of $2500.
19. Find 7 hundredths of $2500. .08 of $2500.

* See that pupils know the meaning of these expressions *before* they attempt to solve the problems. Problem (f) may mean, *find one-half of 4.38*, or it may mean, *find how many times 2 is contained in 4.38;* but it can do no harm for the pupils to regard it for the present as similar to problem (e).

Decimals—Hundredths.

Review page 164.

Lead the pupil to perceive that 1 ÷ 100 = .01; that 4 ÷ 100 = .04; that 44 ÷ 100 = .44.

1. One hundredth of 6 is —— hundredths. .02 of 6 =
2. One hundredth of 3 is —— hundredths. .02 of 3 =
3. One hundredth of 5 is —— hundredths. .03 of 5 =
4. One hundredth of 4 is —— hundredths. .03 of 4 =

5. One hundredth of $8 is —. .04 of $8 =
6. One hundredth of $6 is —. .07 of $6 =
7. One hundredth of $9 is —. .06 of $9 =
8. One hundredth of $7 is —. .08 of $7 =

9. One hundredth of $25 is —. .03 of $25 =
10. One hundredth of $32 is —. .02 of $32 =
11. One hundredth of $43 is —. .02 of $43 =
12. One hundredth of $125 is —. .02 of $125 =

13. One tenth of $3 is —. .2 of $3 =
14. One hundredth of $3 is —. .02 of $3 =
15. One tenth of $5 is —. .3 of $5 =
16. One hundredth of $5 is —. .03 of $5 =
17. One tenth of $12 is —. .2 of $12 =
18. One hundredth of $12 is —. .02 of $12 =
19. One tenth of $120 is —. .2 of $120 =
20. One hundredth of $120 is —. .02 of $120 =
21. One hundredth of $106 is —.* .03 of $106 =

(a) Tell the meaning of the following expressions, (b) copy and complete, and (c) tell the suggested number stories.

(a) $24.45 × 3 = (b) $24.45 ÷ 3 = (c) $24.45 ÷ $.03 =
(d) $15.25 × 5 = (e) $15.25 ÷ 5 = (f) $15.25 ÷ $.05 =
(g) $51.04 × 4 = (h) $51.04 ÷ 4 = (i) $51.04 ÷ $.04 =
(j) $45.30 × 6 = (k) $45.30 ÷ 6 = (l) $45.30 ÷ $.06 =
(m) $66.96 × 8 = (n) $66.96 ÷ 8 = (o) $66.96 ÷ $.08 =

* Require pupils to copy the above, writing the answers in figures.

Decimals—Hundredths.

1. Harry paid $2 for 100 pencils; one pencil cost —— hundredths of a dollar.

2. Arthur paid $4 for 10 first readers; one first reader cost —— tenths of a dollar.

3. Mr. Jones paid $26 for 100 water-melons; one water-melon cost ————.

4. Mr. Rice paid $45 for 10 cords of wood; one cord of wood cost ————.

5. If one pound of sugar is worth $.04, 100 pounds of sugar are worth ————.

6. If one ton of coal is worth $6.50, 10 tons of coal are worth ————.

7. One bushel of wheat weighs 60 pounds; 10 bushels of wheat weigh ————.

8. One bushel of oats weighs 32 pounds; 100 bushels of oats weigh ————.

9. $45 \times 10 =$ $45 \div 10 =$ $45 \div 100 =$ $45 \times 100 =$

10. $24 \times 10 =$ $24 \div 10 =$ $24 \div 100 =$ $24 \times 100 =$

(a) Find 7 hundredths of 324.
(b) Find 6 hundredths of 437.
(c) Find 4 tenths of 523.
(d) Find 9 tenths of 231.
(e) Find 5 hundredths of 336.
(g) Find 3 hundredths of 742.
(i) Find 1 half of 624.
(k) Find 1 half of 436.
(m) Find 1 fourth of 48.
(o) Find 3 fourths of 48.
(q) Find 4 fifths of 25.

Model.
.01 of 324 = 3.24
.07 of 324 = 22.68

(f) .5 of 336 =
(h) .3 of 742 =
(j) .5 of 624 =
(l) .50 of 436 =
(n) .25 of 48 =
(p) .75 of 48 =
(r) .8 of 25 =

Decimals—Hundredths.

Review page 165.

Teach the pupil that the expression, 600 × .02 (600 multiplied by .02), means, *find 2 hundredths of 600;* that the expression, 600 × 2.02 (600 multiplied by 2.02), means, *find 2 times 600 plus 2 hundredths of 600.*

1. 600 × .03, means, find 3 100ths of 600. .03 of 600 =
2. 400 × .03, means, find 3 100ths of 400. .03 of 400 =
3. 200 × .08, means, ———————. .08 of 200 =
4. 500 × .07, means, ———————. .07 of 500 =

5. 123 × .01, means, find 1 100th of 123. .01 of 123 =
6. 123 × .02, means, ———————. .02 of 123 =
7. 241 × .02, means, ———————. .02 of 241 =
8. 222 × .03, means, ———————. .03 of 222 =

9. $24 × .01, means, find 1 100th of $24. .01 of $24 =
10. $24 × .02, means, ———————. .02 of $24 =
11. $32 × .03, means, ———————. .03 of $32 =
12. $62 × .03, means, ———————. .03 of $62 =

13. $6 × .01, means, find 1 100th of $6. .01 of $6 =
14. $6 × .02, means, ———————. .02 of $6 =
15. $8 × .09, means, ———————. .09 of $8 =
16. $7 × .05, means, ———————. .05 of $7 =

17.	$2 × 3 =	$2 × .3 = *	$2 × .03 = *
18.	$23 × 3 =	$23 × .3 =	$23 × .03 =
19.	$62 × 2 =	$62 × .2 =	$62 × .02 =
20.	$26 × 2 =	$26 × .2 =	$26 × .02 =
21.	$60 × 2 =	$60 × .1 =	$60 × 2.1 = *
22.	$600 × 2 =	600 × .01 =	600 × 2.01 = *
23.	$600 × 3 =	600 × .02 =	600 × 3.02 = *
24.	$400 × 3 =	400 × .03 =	400 × 3.03 = *
25.	$400 × 2 =	400 × .2 =	400 × 2.2 = *

* See that pupils know the meaning of these expressions before they attempt to solve the problems.

Decimals—Hundredths.

1. When coal costs $4 per ton,—

2 tons cost ——.	3 tons cost ——.
.1 of a ton costs ——.	.2 of a ton cost ——.
.3 of a ton cost ——.	2.1 tons cost ——.
2.2 tons cost ——.	2.3 tons cost ——.

2. When land costs $300 per acre,—

2 acres cost ——.	3 acres cost ——.
.1 of an acre costs ——.	.2 of an acre cost ——.
.3 of an acre cost ——.	.4 of an acre cost ——.
.01 of an acre costs	.02 of an acre cost ——.
.03 of an acre cost ——.	.04 of an acre cost ——.
2.1 acres cost ——.	2.2 acres cost ——.
2.01 acres cost ——.	2.02 acres cost ——.
2.03 acres cost ——.	2.04 acres cost ——.
2.12 acres cost ——.*	2.32 acres cost ——.

3. When coal costs $6 per ton,—

2 tons cost ——.	3 tons cost ——.
.1 of a ton costs ——.	.2 of a ton cost ——.
1.1 tons cost ——.	2.1 tons cost ——.

4. When corn meal costs $20 per ton,—

2 tons cost ——.	3 tons cost ——.
.1 of a ton costs ——.	.2 of a ton cost ——.
.01 of a ton costs	.02 of a ton cost ——.
.3 of a ton cost ——.	.03 of a ton cost ——.
2.1 tons cost ——.	1.01 tons cost ——.
2.2 tons cost ——.	2.02 tons cost ——.
2.12 tons cost ——.	2.32 tons cost ——.

* As a preparation for what is to follow, lead the pupil to think this in two ways: (a) 2 acres cost $600; .12 of an acre cost $36; 2.12 acres cost $636. (b) 2 acres cost $600; .1 of an acre costs $30; .02 of an acre cost $6; 2.12 acres cost $636. Do not, at first, require the pupil to make a formal "analysis" of his work. Be sure that he *thinks* and can give correct results. Later he may be required to "explain"—to "think aloud"—to "analyze."

Decimals—Hundredths.

(a) Multiply $234 by 3.25. This means, *find three times $234 plus two tenths of $234 plus five hundredths of $234.*

Operation No. 1.		*Explanation.*
$234.		Three times $234 are $702.
3.25		One tenth of $234 is $23.4.
$702.	(3 times $234.)	Two tenths of $234 are $46.8.
$46.8	(.2 of $234.)	One hundredth of $234 is $2.34.
$11.70	(.05 of $234.)	Five hundredths of $234 are $11.70.
$760.50	(3.25 times $234.)	$702 + $46.8 + $11.70 = $760.50.

Operation No. 2.		*Explanation.*
$234		One hundredth of $234 is $2.34.
3.25		Five hundredths of $234 are $11.70.
$11.70	(.05 of $234.)	One tenth of $234 is $23.4.
$46.8	(.2 of $234.)	Two tenths of $234 are $46.8.
$702.	(3 times $234.)	Three times $234 are $702.
$760.50	(3.25 times $234.)	$11.70 + $46.8 + $702 = $760.50.

Suggested Number Story.

If one acre of land is worth $324,
1 hundredth of an acre is worth ———.
5 hundredths of an acre are worth ———.
1 tenth of an acre is worth ———.
2 tenths of an acre are worth ———.
3 acres are worth ———.
3.25 acres are worth ———.

In the manner indicated above, require pupils (a) to tell the meaning of each of the following, (b) to perform, and (c) to tell a suggested number story. Require the pupil to write a decimal point *immediately after* writing the tenths' figure of each partial product.

(b) Multiply $521 by 4.25. (c) Multiply $346 by 2.25.
(d) Multiply $435 by 6.25. (e) Multiply $164 by 5.25.

Decimals—Hundredths.

1. A farmer paid $4.2 for a sheep and $2.25 for a lamb; for both he paid ———.*

(a) A farmer paid $125 for a horse, $95 for a buggy, and $24.50 for harness. How much did he pay for all?

2. A boy paid $4.65 for a coat and a pair of shoes; for the shoes he paid $2.2; for the coat he paid ———.*

(b) A man paid $346.5 for wood and coal; for the wood he paid $38.25. How much for the coal?

3. Harry had $5; he spent $2 for books and $2.55 for clothing; he then had ———.*

(c) Harry's father had $645.75; he spent $25.2 for groceries and $34.75 for fuel. How much money had he left?

4. If one load of wood is worth $4.25, two loads are worth ———.*

(d) At $275.25 an acre, how much are four acres of land worth?

5. William paid $.4 for oranges at $.05 each; he bought ——— oranges.*

(e) William's father paid $19.6 for posts at $.08 each. How may posts did he buy?‡

6. Mary paid $.6 for 5 yards of ribbon; one yard cost ———.*

(f) Mary's mother paid $16.25 for 5 curtains. How much did she pay for one curtain?

(g) $17.24 ÷ $.04 = (h) $17.24 ÷ 4 =

(i) $18 ÷ $.04 = (j) $18 ÷ 4 =

* Require written solutions of these problems *after* the pupil has solved them "mentally" and given correct answers. Problems designated by *letters* are for the slate.

‡ Find how many times 8 hundredths of a dollar are contained in 1960 hundreth-dollars.

Decimals—Hundredths.

7. At $300 a mile, how much will it cost to make 2.25 miles of road? 2 miles cost ——; 2 tenths of a mile cost ——; 5 hundredths of a mile cost ——; 2.25 miles cost ——.*

(k) At $345 a mile how much will it cost to make 3.25 miles of road? $345 × 3.25 = $345 × 3¼ = †

8. Alice paid $1.26 for some tablets that cost $.06 each; there were —— tablets.*

Give the answer to each of the following:

$.05)$.60 $.05)$.65 $.05)$1 $.05)$2 $.05)$2.25

(l) Mr. Dunn paid $25.02 for paper that cost $.06 a pound. How many pounds were there?

9. Sarah paid $1.60 for 4 yards of ribbon; one yard cost ——.*

Give the answer to each of the following:

4)$1.20 4)$1.4 8)$1.6 8)$1.2 7)$1.4

(m) Mr. King paid $52.60 for 4 tons of bran. How much did it cost per ton?

10. Charlie paid $.12 for 3 pencils; at the same rate 7 pencils would cost ——.

(n) Mr. Johnson paid $26.50 for 2 tons of hay. At the same rate how much would 7 tons cost?

(o) How much will 5 cords of wood cost if 2 cords cost $8.50?

(p) If 3 tons of corn meal cost $54, how much will 5.3 tons cost? 6.2 tons?

* After this has been solved "mentally" and the answer given, show how it may be solved with the aid of a pencil.

† Lead pupils to see that 3¼ times $345 is the same as 3 times $345 plus .2 of $345 plus .05 of $345.

Decimals—Hundredths.

11. Mr. Bliss had .72 of an acre of land which he divided into lots each containing .09 of an acre; there were —— lots.

Give the answer to each of the following:

.09 of an acre)1.80 acres. .09 of an acre)2.79 acres.

.09 of an acre)3.60 acres.

(q) Mr. Wheeler had 3.78 acres of land which he divided into lots each containing .09 of an acre. How many lots?

12. Dr. Harris had 6.36 acres of land; he divided it into 3 equal lots; each lot contained ————.

Give the answer to each of the following:

2)4.18 acres. 2)6.06 acres. 2)7.06 acres. 3)8.34 acres.

(r) Gen. Dow had 76.25 acres of land which he divided into 5 equal lots. How much in each lot?

13. Mr. Parker had 4 equal lots of land; each lot contained 1.05 acres; in all he had ————.

Give the answer to each of the following:

3.06 acres.	2.08 acres.	2.22 acres.	7.33 acres.
4	5	3	2

(s) Mr. Green had 4 equal lots of land; each lot contained 35.24 acres. How much land had he in all?

14. The sum of 2.3 acres and 2.04 acres is ————.

(t) The sum of 27.4 acres and 48.36 acres is ————.

15. The difference of 4.25 acres and 2.1 acres is ————.

(u) The difference of 278.48 acres and 152.7 acres is ————.

16. The product of 4.3 acres multiplied by 3 is ————.

(v) The product of 25.64 acres multiplied by 6 is ————.

Decimals—Hundredths.

18. Robert had $1.25; this is $\frac{1}{5}$ as much as Peter had; Peter had ————.

(w) Mr. Hill had $24.45; this is $\frac{1}{5}$ as much as Mr. Ford had. How much money did Mr. Ford have?

19. Frank's book cost $1.20; his slate cost $\frac{1}{8}$ as much; his slate cost ————.

(x) Mrs. Ford's carpet cost $54.78; her curtains cost $\frac{1}{3}$ as much. How much did her curtains cost?

20. When apples are worth $.40 a bushel, $\frac{1}{4}$ of a bushel is worth ————. $\frac{3}{4}$ of a bushel are worth ————.

(y) When meal is worth $18 per ton, how much is $\frac{1}{4}$ of a ton worth? $\frac{3}{4}$ of a ton?

21. James paid $.60 for $\frac{3}{4}$ of a bushel of peaches; at the same rate, a bushel would cost ————.

(z) Mr. Keen paid $6.45 for $\frac{3}{4}$ of a ton of coal. At the same rate how much would $\frac{1}{4}$ of a ton cost? How much would 1 ton cost?

(a) Mrs. Williams paid $4.20 for $\frac{3}{4}$ of a cord of wood. At the same rate how much would 1 cord cost? 5 cords?

22. If 2 yards of muslin are worth $.12, seven yards are worth ————.

(b) If two barrels of apples are worth $6.50, how much are five barrels worth? Seven barrels?

23. If 1 acre of land is worth $400, .1 of an acre is worth ————; .01 of an acre is worth ————.

(c) At $45 per acre, how much will .2 of an acre cost? How much will .07 of an acre cost? How much will 2 acres cost? How much will 2.27 acres cost?

(d) At $65 per acre, how much will .2 of an acre cost? How much will .05 of an acre cost? How much will 2 acres cost? How much will 2.25 acres cost? How much will $2\frac{1}{4}$ acres cost?

Decimals—Hundredths.

(a) Tell the meaning, (b) complete, and (c) tell the suggested number stories.

1. $300 × .2 = *	(a) $370 × .2 =
2. $320 × .2 =	(b) $328 × .2 =
3. $300 × .02 =	(c) $345 × .02 =
4. $300 × 2.2 =	(d) $370 × 2.2 =
5. $300 × 2.02 =	(e) $345 × 2.02 =
6. $300 × 2.22 =	(f) $234 × 2.22 =
7. $4 ÷ $.2 = †	(g) $24 ÷ $.2 =
8. $6 ÷ $.02 =	(h) $36 ÷ $.02 =
9. $3.4 ÷ $.2 =	(i) $43.4 ÷ $.2 =
10. $6.44 ÷ $.02 =	(j) $56.38 ÷ $.02 =
11. $2.4 ÷ $.02 =	(k) $34.4 ÷ $.02 =
12. $4.8 ÷ $1.2 =	(l) $52.8 ÷ $1.2 =
13. $2.50 ÷ $1.25 =	(m) $7.50 ÷ $1.25 =
14. $3 ÷ $1.50 =	(n) $27 ÷ $1.50 =
15. $4.4 ÷ 2 = ‡	(o) $46.8 ÷ 2 =
16. $1.6 ÷ 2 =	(p) $47.8 ÷ 2 =
17. $4.04 ÷ 2 =	(q) $74.04 ÷ 2 =
18. $6.66 ÷ 2 =	(r) $56.38 ÷ 2 =
19. $4.5 ÷ 5 =	(s) $37.5 ÷ 5 =
20. $.35 ÷ 5 =	(t) $6.35 ÷ 5 =
21. $5.35 ÷ 5 =	(u) $35.25 ÷ 5 =
22. $8.88 ÷ 4 =	(v) $73.28 ÷ 4 =
23. $3.6 ÷ 3 =	(w) $63.6 ÷ 3 =
24. $3.6 ÷ $.3 =	(x) $63.6 ÷ $.3 =
25. $8.4 ÷ 4 =	(y) $48.04 ÷ 4 =
26. $8.4 ÷ $.04 =	(z) $48.04 ÷ $.04 =
27. $804 × .04 =	(aa) $48.04 × .04 =

* $300 multiplied by .2, means, *find 2 tenths of $300.*
† $4 divided by $.2, means, *find how many times, etc.*
‡ $4.4 divided by 2, means, *find 1 half of $4.4.*

Decimals—Hundredths.

(a) Tell the meaning, (b) copy and solve, and (c) tell the suggested number stories.

(a) Find the sum of $46, $275, and $342.27.
(b) Find the difference of $467.2 and $275.38.
(c) Find the product of $345.24 multiplied by 4.
(d) Find the product of $2746 multiplied by .5.*
(e) Find the product of $35.62 multiplied by .05.
(f) Find the product of $624 multiplied by 2.5.†
(g) Find the product of $534 multiplied by 3.05.
(h) Find the product of $476 multiplied by 2.35.

(i) Find the quotient of 382.5 divided by .5.
(j) Find the quotient of 382.5 divided by 5.

(k) Find the quotient of $28.50 divided by $.05.
(l) Find the quotient of $28.50 divided by 5.

(m) Find the quotient of 74.4 divided by .4.
(n) Find the quotient of 74.4 divided by 4.

(o) Find the quotient of 85.2 divided by .6.
(p) Find the quotient of 85.2 divided by 6.

1. Find $\frac{2}{3}$ of $1.2.
2. $1.2 is $\frac{2}{3}$ of what?

(q) Find $\frac{2}{3}$ of $37.8.
(r) $37.8 is $\frac{2}{3}$ of what?

3. Find $\frac{2}{3}$ of $.18.
4. $.18 is $\frac{2}{3}$ of what?

(s) Find $\frac{2}{3}$ of $4.74.
(t) $4.74 is $\frac{2}{3}$ of what?

5 Find $\frac{3}{4}$ of $1.2.
6. $1.2 is $\frac{3}{4}$ of what?

(u) Find $\frac{3}{4}$ of $14.4.
(v) $14.4 is $\frac{3}{4}$ of what?

7. Find $\frac{3}{4}$ of $.24.
8. $.24 is $\frac{3}{4}$ of what?

(w) Find $\frac{3}{4}$ of $2.88.
(x) $2.88 is $\frac{3}{4}$ of what?

9. Find $\frac{2}{5}$ of $.25.
10. $.20 is $\frac{2}{5}$ of what?

(y) Find $\frac{2}{5}$ of $15.25.
(z) $4.76 is $\frac{2}{5}$ of what?

*$2746 multiplied by .5, means, *find 5 tenths of $2746.*
†$624 multiplied by 2.5, means, *find 2 times $624 plus 5 tenths of $624.*

Common Fractions.

halves fourths eighths sixteenths

1. One half is —— sixteenths.
2. One fourth is —— sixteenths.
3. One eighth is —— sixteenths.
4. Three eighths are —— sixteenths.
5. One fourth and 1 sixteenth are ————.
6. One fourth less 1 sixteenth are ————.
7. Three eighths and 1 sixteenth are ————.
8. Three eighths less 1 sixteenth are ————.

9.	$\frac{5}{8} + \frac{3}{16}$, means, ————.	$\frac{5}{8} + \frac{3}{16}$ =
10.	$\frac{5}{8} - \frac{3}{16}$, means, ————.	$\frac{5}{8} - \frac{3}{16}$ =
11.	$\frac{7}{16} \times 3$, means, ————.	3 times $\frac{7}{16}$ =
12.	$12 \times \frac{3}{4}$, means,* ————.	$\frac{3}{4}$ of 12 =
13.	$12 \times 2\frac{3}{4}$, means,* ————.	$2\frac{3}{4}$ times 12 =
14.	$\frac{3}{8} \div \frac{1}{16}$, means,* ————.	$\frac{1}{16}$ is ——.
15.	$2 \div \frac{3}{8}$, means,* ————.	$\frac{3}{8}$ are ——.
16.	$\frac{3}{8} \div 2$, means,* ————.	$\frac{1}{2}$ of ——.

For the Slate.

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$536\frac{3}{8}$	$746\frac{1}{8}$	275	$2)\overline{\$363\frac{1}{2}}$
$124\frac{5}{16}$	$182\frac{3}{16}$	$27\frac{1}{8}$	

(a) Tell the meaning. (b) Copy and complete. (c) Tell the suggested number stories.

(e)	(f)
7 days)365 days.	7)365 days.
(g)	(h)
8 quarts)256 quarts.	8)256 quarts.

* See foot-notes, page 175.

Common Fractions.

1. Add $\frac{5}{8}$ and $\frac{9}{16}$. (Change $\frac{5}{8}$ to $\frac{10}{16}$.)
2. Add $\frac{3}{4}$ and $\frac{1}{8}$. (Change $\frac{3}{4}$ to $\frac{6}{8}$.)

3. From $\frac{9}{16}$ subtract $\frac{3}{8}$. ($\frac{3}{8} = \frac{6}{16}$.)
4. From $\frac{5}{8}$ subtract $\frac{1}{4}$. ($\frac{1}{4} = \frac{2}{8}$.)

5. Multiply 10 by $2\frac{3}{5}$. (2 times 10, plus $\frac{3}{5}$ of 10.)
6. Multiply $6\frac{3}{8}$ by 4. (4 times $\frac{3}{8}$, plus 4 times 6.)

7. Divide $\frac{6}{8}$ by 2. (Find 1 half of $\frac{6}{8}$.)
8. Divide 2 by $\frac{6}{8}$. (Find how many times, etc.)

9. Find the sum of $5\frac{1}{8}$ and $5\frac{1}{16}$.
10. Find the sum of $3\frac{1}{4}$ and $3\frac{1}{16}$.

11. Find the difference of $8\frac{3}{8}$ and $4\frac{1}{16}$.
12. Find the difference of 6 and $2\frac{7}{16}$.

13. Find the product of 8 multiplied by $2\frac{3}{4}$.
14. Find the product of $2\frac{3}{4}$ multiplied by 8.

15. Find the quotient of $\frac{3}{4}$ divided by 4.
16. Find the quotient of 4 divided by $\frac{3}{4}$.*
17. Find the quotient of $1\frac{1}{4}$ divided by 4.†
18. Find the quotient of $1\frac{3}{4}$ divided by 4.

19. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} = ?$ ($\frac{1}{2} = \frac{4}{8}$. $\frac{1}{4} = \frac{2}{8}$.)
20. $\frac{1}{4} + \frac{1}{8} + \frac{1}{16} = ?$ ($\frac{1}{4} = \frac{4}{16}$. $\frac{1}{8} = \frac{2}{16}$.)
21. $\frac{1}{2} + \frac{3}{4} + \frac{3}{8} = ?$ ($\frac{1}{2} = \frac{4}{8}$. $\frac{3}{4} = \frac{6}{8}$.)
22. $\frac{3}{4} + \frac{3}{8} + \frac{3}{16} = ?$ ($\frac{3}{4} = \frac{12}{16}$. $\frac{3}{8} = \frac{6}{16}$.)

For the Slate.

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$784\frac{5}{8}$	$967\frac{3}{4}$	475	$6)945\frac{1}{2}$
$142\frac{9}{16}$	$281\frac{11}{16}$	$5\frac{1}{4}$	

*4 = $\frac{16}{4}$; 3 fourths are contained in 16 fourths ——— and ——— ——— times. See first six problems on page 177.

†$1\frac{1}{4} = \frac{5}{4}$; 1 fourth of $\frac{5}{4}$ is ——— ———.

Miscellaneous Problems in Fractions.

1. Add $\frac{2}{3}$, $\frac{1}{6}$, and $\frac{1}{12}$. (Change $\frac{2}{3}$ and $\frac{1}{6}$ to —— ths.)
2. Add $\frac{1}{2}$ and $\frac{5}{7}$. (Change $\frac{1}{2}$ and $\frac{5}{7}$ to —— ths.)
3. From $\frac{4}{5}$ subtract $\frac{1}{2}$. (Change $\frac{4}{5}$ and $\frac{1}{2}$ to —— ths.)
4. From $\frac{6}{7}$ subtract $\frac{1}{2}$. (Change $\frac{6}{7}$ and $\frac{1}{2}$ to —— ths.)
5. Multiply $\frac{4}{5}$ by 3. (Three times ————.)
6. Multiply $\frac{2}{3}$ by 5. (Five times ————.)
7. Multiply 12 by $\frac{2}{3}$. (Two thirds of ————.)
8. Multiply 15 by $\frac{2}{5}$. (Two fifths of ————.)
9. Multiply 6 by $2\frac{1}{2}$. (Two times 6, plus $\frac{1}{2}$ of 6.)
10. Multiply $4\frac{1}{2}$ by $2\frac{1}{2}$. (Two times $4\frac{1}{2}$, plus $\frac{1}{2}$ of $4\frac{1}{2}$.)
11. Divide 4 by $\frac{2}{3}$. (Change 4 to ——.)
12. Divide $5\frac{1}{5}$ by $\frac{2}{5}$. (Change $5\frac{1}{5}$ to ——.)
13. Divide $\frac{1}{2}$ by $\frac{1}{4}$. (Change $\frac{1}{2}$ and $\frac{1}{4}$ to ——.)
14. Divide $\frac{8}{7}$ by 2. (One half of ——.)
15. Divide $\frac{3}{4}$ by 3. (One third of ——.)

16. Find the sum of $\frac{1}{8}$ and $\frac{1}{4}$. $\frac{1}{4} + \frac{1}{2} + \frac{1}{8} =$
17. Find the difference of $\frac{2}{3}$ and $\frac{1}{4}$. $4\frac{2}{3} - 1\frac{1}{4} =$
18. Find the product of $\frac{3}{5}$ and 4. $\frac{2}{3} \times 6 =$
19. Find the product of 6 and $1\frac{1}{2}$. $8 \times 2\frac{1}{2} =$
20. Find the quotient of 5 divided by $\frac{1}{2}$. $5 \div \frac{1}{3} =$
21. Find the quotient of $\frac{1}{2}$ divided by 5. $\frac{1}{2} \div 6 =$

For the Slate.*

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Multiply.
$375\frac{1}{2}$	$564\frac{2}{3}$	$275\frac{1}{2}$	462
$146\frac{3}{4}$	$146\frac{1}{2}$	3	$2\frac{1}{2}$

(e) Divide.	(f) Divide.	(g) Multiply.	(h) Divide.
$2\frac{1}{2})360$†	$2)480\frac{1}{2}$	175.2	.3)43.8
		6	

* Require pupils to tell suggested number stories.
† See foot-note, page 184.

Simple Numbers.

Teach the meaning and use of the terms *multiplicand* and *multiplier*. Show that the multiplicand and the product are *like numbers;* that the multiplier tells how many times the multiplicand is to be taken; that the product divided by the multiplier gives the multiplicand; that the product divided by the multiplicand gives the multiplier.

(a)	(b)	(c)	(d)
12 dollars	15 oranges	25¢	275
3	5	3	4
36 dollars	75 oranges	75¢	1100

1. In problem (a) the multiplicand is ——; the multiplier is ——; the product is ——.

2. In problem (b) the multiplier is ——; the product is ——; the multiplicand is ——.

3. In problem (c) the product is ——; the multiplier is ——; the multiplicand is ——.

4. In a problem the product is 36 dollars; the multiplier is 4; the multiplicand is ——.

5. In a problem the product is 40 oranges; the multiplicand is 8 oranges; the multiplier is ——.

6. The product of two numbers is 45; one of the numbers is 5; the other number is ——.

7. In a problem the multiplicand is 9 square feet; the multiplier is 3; the product is ——.

8. In a problem the multiplicand is 12 bushels; the multiplier is 4; the product is ——.

9. N. B.—The multiplier can never be a number of dollars or cents or oranges or books or feet or inches. It is always *simply a number* that tells how many times the multiplicand is to be taken.

10. *Two cents multiplied by two cents = nonsense.*

11. If the multiplicand is bushels, the product is —— ; if the multiplicand is square inches, the product is square inches.

Denominate Numbers.

16 ounces = 1 lb.*

1. Two pounds are ——— ounces.
2. Three pounds are ——— ounces.
3. One half of a pound is ——— ounces.
4. One fourth of a pound is ——— ounces.
5. One eighth of a pound is ——— ounces.
6. Three fourths of a pound are ——— ounces.
7. Three eighths of a pound are ——— ounces.
8. One and ½ pounds are ——— ounces.
9. Twenty ounces are ——— and ——— ——— pounds.
10. When cheese costs 16¢ a pound, 1 ounce costs ——— cent; ½ lb. costs ——— cents; 5 ounces cost ——— cents.
11. Henry bought 1 lb. 7 oz. of cheese at 16¢ a pound; the cheese cost ——— cents.
12. 2 lb. 8 oz. grapes at 10¢ a pound cost ————.
13. 1 lb. 4 oz. meat at 12¢ a pound cost ————.
14. 1 lb. 8 oz. meat at 12¢ a pound cost ————.
15. 1 lb. 12 oz. meat at 12¢ a pound cost ————.
16. 1 lb. 5 oz. cheese at 16¢ a pound cost ————.
17. Mary gave a salesman 3 dimes in payment for 2 lb. 8 oz. maple sugar at 10¢ a pound; she should receive in change ——— cents.
18. Arthur gave a salesman ¼ of a dollar in payment for 1 lb. 6 oz. cheese at 16¢ a pound; he should receive in change ——— cents.
19. Coral gave a salesman half a dollar in payment for 2 lb. 8 oz. meat at 12¢ a pound; he should receive in change ——— cents.

*The pupil should be required to estimate the weight of many objects, and afterwards to weigh them. Teach the abbreviations *oz.* and *lb.*

Measurements.

Put a 2-inch cube into the hands of each pupil. Lead the pupils to notice (a) the shape of each face, (b) the area of each face, (c) the number of faces.

Require one or more of the pupils to construct a box 5 inches long, 3 in. wide, and 2 in. high. Lead all to notice the form and area of the top and bottom, of the ends, of the sides. If this work has been properly done, both the cubes and the box can be removed from sight while the pupils read pages 220 and 221.

1. A cube has —— square faces. The area of each face of a two-inch cube is —— square inches. The area of all the faces of a two-inch cube is —— square inches.

2. The area of each face of a three-inch cube is —— square inches. The area of all the faces of a three-inch cube is —— square inches.

3. Can you take your pencil and find the area of all the faces of a 4-inch cube? of a 5-inch cube? of a 6-inch cube?

4. Henry has a box that is 5 inches long, 3 inches wide, and 2 inches high.

(1) The area of the top of the box is —— square inches.
(2) The area of the bottom of the box is —— —— ——.
(3) The area of the top and bottom is —— —— ——.
(4) The area of one side of the box is —— —— ——.
(5) The area of both sides of the box is —— —— ——.
(6) The area of one end of the box is —— —— ——.
(7) The area of both ends of the box is —— —— ——.
(8) Can you tell without your pencil the area of the entire outside of the box?

5. Imagine a box 4 in. long, 3 in. wide, and 2 in. high.

(1) The area of its top is —— square inches.
(2) The area of one side is —— square inches.
(3) The area of one end is —— square inches.
(4) Can you tell without your pencil the area of the entire outside of this imaginary box?

Measurements.

1. Can you imagine a box 4 feet long, 2 feet wide and 1 foot high?*

(1) The area of the top of this box is —— square ——.
(2) The area of the bottom of this box is —— —— ——.
(3) The area of one side of this box is —— —— ——.
(4) The area of both sides of this box is —— —— ——.
(5) The area of one end of this box is —— —— ——.
(6) The area of both ends of this box is —— —— ——.
(7) Can you tell without a pencil how many square feet of paper would be required to cover the entire outside of this box.

2. Imagine a 1-foot cube. It has —— faces. Each face is a 1-foot ——. The area of the entire surface of the cube is —— square feet.

3. Imagine a 2-foot cube. It has —— faces. Each face is a —— square. The area of each face is —— square feet. The area of the entire surface of the cube is —— square feet.

4. The top of a desk is 3 feet wide and 4 feet long; its area is —— square feet.

5. A blackboard is 4 feet wide and 10 feet long; its area is —— square feet.

6. A rug is 6 feet wide and 8 feet long; its area is —— square feet.

7. A floor is 8 feet wide and 10 feet long; its area is —— square feet.

8. A walk is 4 feet wide and 100 feet long; its area is —— square feet.

*To the Teacher.—Assist the imagination of the pupil, if necessary, by leading him to indicate the space such a box would occupy.

Ratio and Proportion.

Read the first set of problems on this page, thus: *9 is ¾ of 12. 12 is ⅓ of 9, or 1⅓ times 9.* **See statement on page 192.**

9 is —— —— of 12. 12 is —— —— of 9, or —— times 9.
6 is —— —— of 8. 8 is —— —— of 6, or —— times 6.
12 is —— —— of 16. 16 is —— —— of 12, or —— times 12.
15 is —— —— of 20. 20 is —— —— of 15, or —— times 15.
18 is —— —— of 24. 24 is —— —— of 18, or —— times 18.
18 is —— —— of 27. 27 is —— —— of 18, or —— times 18.
30 is —— —— of 40. 40 is —— —— of 30, or —— times 30.

1. 30¢ pays for 12 lemons; 40¢ pays for ——.
2. 15¢ pays for 6 oranges; 20¢ pays for ——.
3. 3¢ pays for 6 apples; 12¢ pays for ——.
4. 10¢ pays for 6 yards; 15¢ pays for ——.
5. $6 pays for 20 bushels; $9 pays for ——.
6. $1.00 pays for 12 tickets; 75¢ pays for ——.
7. 20¢ pays for 8 bananas; 15¢ pays for ——.
8. $40 pays for 12 tons; $30 pays for ——.
9. $30 pays for 12 tons; $20 pays for ——.
10. $20 pays for 12 tons; $15 pays for ——.
11. $15 pays for 12 tons; $10 pays for ——.

12. Helen has 75¢; Bertha has 50¢; if Helen can buy 12 yards of ribbon, Bertha can buy ————.

13. Roy has 15¢; David has 20¢; if Roy can buy 12 oranges, David can buy ————.

14. If 3 horses consume 60 ears of corn in a day, 4 horses will consume ————.

15. If Willie can earn 24¢ in 3 hours, in 4 hours he can earn ————.

16. If a man can earn $15 in 6 days, in 8 days he can earn ———— dollars.

17. If 12 lb. of nails cost 30¢, at the same rate 16 lb. will cost ———— cents.

Ratio and Proportion.

1. Twelve oranges are worth —— times as much as 9 oranges. If 9 oranges are worth 15¢, 12 oranges are worth —— cents.

2. Thirty eggs are worth —— times as much as 20 eggs. If 20 eggs are worth 18¢, 30 eggs are worth —— cents.

3. Six ponies consume —— —— as many oats in a day as 8 ponies. If 8 ponies consume 20 quarts, 6 ponies consume —— quarts.

4. A man can earn —— times as much money in eight days as he can in 6 days. If he can earn $21 in 6 days, in 8 days he can earn ——.

5. If 15 lbs. of sugar are worth 60¢, 20 lbs. are worth —— cents.

6. $1\frac{1}{3}$ times 6, means, once 6 and $\frac{1}{3}$ of 6, or ——.

7. $1\frac{1}{3}$ times 7, means, once 7 and $\frac{1}{3}$ of 7, or ——.

8. $1\frac{1}{3}$ times 8, means, once eight and $\frac{1}{3}$ of 8, or ——.

9. $1\frac{1}{2}$ times 12 = $1\frac{1}{2}$ times 13 =

10. $1\frac{1}{3}$ times 12 = $1\frac{1}{3}$ times 13 =

11. $1\frac{1}{2}$ times 14 = $1\frac{1}{2}$ times 15 =

12. $1\frac{1}{3}$ times 9 = $1\frac{1}{3}$ times 10 =

13. $1\frac{1}{3}$ times 15 = $1\frac{1}{3}$ times 16 =

14. $1\frac{1}{2}$ times 20 = $1\frac{1}{3}$ times 20 =

15. Eight bushels of beans are worth —— times as much as 6 bushels. If 6 bushels are worth $7, 8 bushels are worth —— dollars.

16. Eight bags of salt are worth —— times as much as 6 bags. If 6 bags are worth $5, 8 bags are worth —— dollars.

17. Twelve bushels of corn are worth —— times as much as 8 bushels. If 8 bushels are worth $3, 12 bushels are worth —— dollars.

Review Problems.*

ADDITION.

(a)	(b)	(c)	(d)	(e)
$424\frac{1}{8}$	536	347.3	6.25	74.6
36	$205\frac{5}{8}$	89	24.06	35.4
$375\frac{5}{16}$	47	255.7	87	82.7
44	$826\frac{11}{16}$	43.2	75	37.5
$71\frac{1}{2}$	$84\frac{1}{4}$	84	8.03	52.1

(f) Add seven hundred six and seven eighths, and seventy-five and five sixteenths.

SUBTRACTION.

(g)	(h)	(i)	(j)	(k)
$828\frac{7}{8}$	954	425.2	48.75	38.1
$182\frac{5}{16}$	$182\frac{11}{16}$	131.8	29.08	19.6

(l) From four hundred forty-four, take two hundred twenty-two and seven eighths.

MULTIPLICATION.

(m)	(n)	(o)	(p)	(q)
$372\frac{3}{16}$	575	326	47.05	26.2.
6	$4\frac{1}{8}$	32	3	$7\frac{1}{2}$

(r) Multiply four hundred six and three sixteenths by five.

DIVISION.

(s)	(t)	(u)	(v)
$4\frac{1}{2})126$ *	$.05)$5.25$ †	$5)$5.25$ †	$.05)$8.00$ †

(w) Divide twenty-four and thirty-two hundredths by two hundredths.

* See foot-note, page 184.

† Tell the meaning. Tell the suggested number story.

Common Fractions.

thirds sixths ninths eighteenths

1. One third is —— eighteenths.
2. One sixth is —— eighteenths.
3. One ninth is —— eighteenths.
4. Two ninths are —— eighteenths.
5. One sixth and 1 eighteenth are ————.
6. One sixth less 1 eighteenth are ————.
7. Five ninths and 1 eighteenth are ————.
8. Five ninths less 1 eighteenth are ————.
9. Eleven eighteenths and 1 third are ————.
10. Eleven eighteenths less 1 third are ————.
11. Seven eighteenths and 1 sixth are ————.
12. Seven eighteenths less 1 sixth are ————.

13. $\frac{5}{9} + \frac{3}{18} =$ $\frac{5}{9} - \frac{3}{18} =$
14. $1\frac{1}{18} \times 2 =$ $12 \times \frac{5}{6} =$ *
15. $12 \times 2\frac{5}{6} =$ * $\frac{5}{9} \div \frac{3}{18} =$ *
16. $2 \div \frac{5}{9} =$ * $\frac{5}{9} \div 2 =$ *

For the Slate.

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$756\frac{5}{9}$	$374\frac{7}{9}$	$437\frac{2}{9}$	$2)\$545\frac{1}{2}$*
$142\frac{7}{18}$	$371\frac{1}{6}$	25	

(a) Tell the meaning. (b) Copy and complete. (c) Tell the suggested number stories.

(e) 8 yards)336 yards

(f) 8)336 yards

(g) 9 inches)207 inches

(h) 9)207 inches

* What does the expression mean? See foot-notes, page 175.

Common Fractions.

1. Add $\frac{5}{9}$ and $\frac{7}{18}$. (Reduce * ————.)
2. Add $\frac{1}{6}$ and $\frac{5}{8}$. (Reduce ————.)
3. From $\frac{5}{9}$ subtract $\frac{7}{18}$. (Reduce ————.)
4. From $\frac{5}{6}$ subtract $\frac{4}{9}$. (Reduce ————.)
5. Multiply 12 by $2\frac{5}{6}$. (2 times ————.)‡
6. Multiply $5\frac{3}{8}$ by 6. (6 times ———— —.)‡
7. Divide $8\frac{5}{9}$ by 2. ($\frac{1}{2}$ of ————.)
8. Divide $2\frac{1}{3}$ by $\frac{5}{9}$. (Find how many times, etc.)
9. Find the sum of $7\frac{1}{9}$ and $7\frac{1}{8}$.
10. Find the sum of $4\frac{7}{18}$ and $3\frac{2}{9}$.
11. Find the difference of 8 and $2\frac{5}{9}$.
12. Find the difference of $9\frac{1}{3}$ and $4\frac{5}{18}$.
13. Find the product of 9 multiplied by $2\frac{2}{3}$.
14. Find the product of $2\frac{2}{3}$ multiplied by 9.
15. Find the quotient of $\frac{2}{3}$ divided by 6.
16. Find the quotient of $6\frac{1}{3}$ divided by $\frac{2}{3}$.†
17. $\frac{1}{2} + \frac{1}{6} + \frac{1}{9} = ?$ (Reduce ————.)
18. $\frac{1}{6} + \frac{1}{9} + \frac{1}{18} = ?$ (Reduce ————.)
19. $\frac{1}{2} + \frac{1}{6} + \frac{1}{18} = ?$ (Reduce ————.)
20. $\frac{1}{2} + \frac{1}{6} + \frac{1}{9} + \frac{1}{18} = ?$ (Reduce ————.)
21. $\frac{1}{2} + \frac{2}{9} + \frac{1}{6} + \frac{5}{18} = ?$ (Reduce ———— —.)
22. $\frac{1}{2} + \frac{1}{3} + \frac{1}{6} + \frac{1}{9} = ?$ (Reduce ————.)

For the Slate.

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$557\frac{5}{9}$	$543\frac{1}{6}$	267	$7)875\frac{1}{3}$
$71\frac{2}{9}$	$171\frac{1}{9}$	$36\frac{1}{3}$	

* See foot-note, page 179.

‡ See page 186, problems 5 and 6.

† $6\frac{1}{3} = \frac{19}{3}$; 2 thirds are contained in 19 thirds —— and —— —— times. See first six problems on page 177.

Miscellaneous Problems in Fractions.*

1. In $1\frac{1}{2}$ hours there are —— minutes.

(a) How many minutes in $7\frac{1}{2}$ hours?

2. Henry earns $\$3\frac{1}{2}$ each week; in 6 weeks he earns —— dollars.†

(b) How many dollars does Henry earn in 52 weeks?

3. James spent $\frac{1}{2}$ of the money his father gave him for a slate and $\frac{1}{4}$ of it for a book, and had $10¢$ left. Before he spent any money he had — cents.

(c) A man spent $\frac{1}{2}$ of his month's wages for fuel and $\frac{1}{4}$ of it for groceries and had $\$12.5$ left. How much was his wages?

4. In $2\frac{1}{2}$ yards there are —— feet.

(d) How many feet in $54\frac{1}{2}$ yards?

5. At $\frac{1}{8}$ of a dollar a yard, 10 yards of ribbon cost —— dollars.

(e) At $\frac{1}{8}$ of a dollar a yard how much will 155 yards of ribbon cost?

6. Alice spent $\frac{4}{8}$ of her money and had $8¢$ left; before spending any money she had —— cents; she spent —— cents.

(f) Alice's mother spent $\frac{4}{8}$ of her money and had $\$73$ left. How much money had she before spending any? How much did she spend?

7. Two thirds of 18 feet are —— feet.

(g) Two thirds of 624 feet are how many feet?

* Problems designated by *letters* are for the slate.

† Lead the pupil to see that in such problems as this, he may consider either number the multiplicand. Thus, he may say, "If Henry earns $\$3\frac{1}{2}$ in one week, in 6 weeks he earns 6 times $\$3\frac{1}{2}$ or $\$21$;" or, he may say, "At $\$1$ a week Henry would, in six weeks, earn $\$6$; at $\$3\frac{1}{2}$ a week he would earn $3\frac{1}{2}$ times $\$6$ or $\$21$." This should be taught as a preparation for the second part of the problem in which it is more convenient to multiply 52 by $3\frac{1}{2}$ than it is to multiply $3\frac{1}{2}$ by 52.

Simple Numbers.

Teach the meaning and use of the terms *dividend* and *divisor*. Show that when it is required to find how many times one number is contained in another, the dividend and divisor are like numbers; that when it is required to find one of the equal parts of a number, the dividend and the quotient are like numbers. Show that the product obtained by using the divisor and the quotient as factors is equal to the dividend; that the dividend divided by the quotient gives the divisor

(a)	(b)	(c)	(d)	(e)
\$3)\$36	3)\$36	7¢)35¢	7)35¢	½)8
12 times	\$12.	5 times.	5¢	16

1. In problem (a) the dividend is ——; the quotient is ——; the divisor is ——.

2. In problem (b) the quotient is ——; the dividend is ——; the divisor is ——.

3. In problem (c) the divisor is ——; the quotient is ——; the dividend is ——.

4. In problem (d) the —— and the —— are like numbers.

5. In problem (c) the —— and the —— are like numbers.

6. In a problem, the divisor is \$3 and the quotient, 10; the dividend is ——.

7. In a problem, the dividend is \$36 and the quotient, \$9; the divisor is ——.

8. In a problem, the divisor is 4 and the quotient, 12¢; the dividend is ——.

9. If the dividend is some number of dollars and the divisor is 4, the quotient is ——.

10. If the divisor is 1, the quotient number is the same as the dividend number.* If the divisor is more than 1, the quotient number is —— than the dividend number.† If the divisor is less than 1 the quotient number is —— than the dividend number.‡

* 1)6 / 6 † 2)6 / 3 ‡ ½)6 / 12

Denominate Numbers.

1. From a can containing 15 qt. of milk, a dealer sold 5 qt. 1 pt.; there remained —— ——.

(a) From 425 qt., subtract 127 qt. 1 pt.

2. A milk dealer sold 2 qt. 1 pt. to his first customer, 3 qt. 1 pt. to his second customer, and 1 qt. 1 pt. to his third customer; to all he sold —— ——.

(b) Add 25 qt. 1 pt., 15 qt. 1 pt., and 22 qt. 1 pt.

3. From a string 5 yd. long, George cut off 2 yd. 2 ft.; there remained —— ——.

(c) From 345 yd., subtract 82 yd. and 2 ft.

4. From a piece of cheese weighing 6 lb. a grocer cut off 1 lb. 12 oz.; there remained —— ——.

(d) From 89 lbs., subtract 17 lbs. 5 oz.

5. Giles gathered 2 bu. 3 pk. of nuts Monday and 1 bu. 3 pk. Tuesday; altogether he gathered —— ——.

(e) Add 25 bu. 3 pk., 46 bu. 2 pk., and 35 bu. 1 pk.

6. Henry's father is 6 feet 1 inch in height; Henry is 4 ft. 9 inches; Henry's father is —— —— taller than Henry.

(f) From 75 ft. 2 in. subtract 43 ft. 8 in.

7. Alice has a picture that is 1 ft. 6 in. wide and 2 ft. 4 in. long; its perimeter is —— ——.

(g) What is the perimeter of the floor of a room that is 14 ft. 6 in. wide and 16 ft. 8 in. long?

8. John had 3 pk. 2 qt. of oats; he fed his ponies 1 pk. 5 qt.; he then had —— ——.

(h) From 46 pk. 2 qt., subtract 21 pk. 5 qt.

(i) Add 35 pk. 3 qt. and 74 pk. 7 qt.

Measurements.

1. A rectangle $\frac{1}{2}$ of an inch wide and 10 inches long contains —— square inches.

(a) A rectangular piece of land is $\frac{1}{2}$ of a foot wide and 238 feet long. How many square feet does it contain?

2. A rectangle 2 feet wide and 2 yards long contains —— square feet.

(b) A rectangular piece of land 2 feet wide and 35 yards long contains how many square feet?

3. A rectangle contains 18 square inches; it is 6 inches long; it is —— inches wide.

(c) A rectangular piece of land contains 726 square feet; it is 6 feet wide. How long is it?

4. The area of one face of a 7-inch cube is —— square inches.

(d) What is the area of all the faces of a 7-inch cube?

5. The area of one face of an 8-inch cube is —— square inches.

(e) What is the area of all the faces of an 8-inch cube?

(f) What is the area of all the faces of a 9-inch cube?

6. Think of a room that is 12 feet long, 10 ft. wide, and 8 feet high. Is it a large or a small room? Could your teacher standing on the floor of such a room, reach the ceiling?

(1) The area of the ceiling is —— square feet.

(2) The area of the floor is —— square feet.

(3) The area of one end wall is —— square feet.

(4) The area of one side wall is —— square feet.

(g) How many square yards in one end wall of the room?

(h) How many square yards in one side wall of the room?

(i) How many square yards in the ceiling of the room?

Measurements.

1. An oblong 1 inch wide and 12 inches long contains —— square inches. It is —— —— of a square foot.

2. An oblong 3 inches wide and 12 inches long contains —— square inches. It is —— —— of a square foot.

3. Twenty-four square inches are —— —— of a square foot.

4. Forty-eight square inches are —— —— of a sq. ft.

5. An oblong 6 inches wide and 12 inches long contains —— square inches. It is —— —— of a square foot.

6. A rectangle 6 in. by 6 in. contains —— sq. inches. It is —— —— of a sq. foot.

7. Sixty square inches are —— —— of a square foot.

8. Eighty-four square inches are —— —— of a sq. foot.

9. An oblong 3 inches wide and 4 inches long contains —— square inches. It is —— —— of a square foot.

10. An oblong 4 inches wide and 6 inches long contains —— square inches. It is —— —— of a square foot.

11. An oblong 6 inches wide and 8 inches long contains —— square inches. It is —— —— of a square foot.

12. An oblong 1 foot wide and 3 feet long contains —— square feet. It is —— —— of a square yard.

13. Six square feet are —— —— of a square yard.

14. Seven square feet are —— —— of a square yard.

15. An oblong 2 feet wide and 4 feet long contains —— square feet. It is —— —— of a square yard.

16. An oblong 3 feet wide and 4 feet long contains —— square feet. It is —— —— —— —— square yards.

17. An oblong 3 feet wide and 5 feet long contains —— square feet. It is —— —— —— —— square yards.

Ratio and Proportion.

Read the first set of problems on this page, thus; *8 is ⅘ of 10. 10 is 1¼ of 8, or 1¼ times 8.* See statement on page 192.

8 is — — of 10.	10 is — — of 8, or — times 8.
6 is — — of 10.	10 is — — of 6, or — times 6.
4 is — — of 10.	10 is — — of 4, or — times 4.
12 is — — of 15.	15 is — — of 12, or — times 12.
9 is — — of 15.	15 is — — of 9, or — times 9.
6 is — — of 15.	15 is — — of 6, or — times 6.
16 is — — of 20.	20 is — — of 16, or — times 16.
12 is — — of 20.	20 is — — of 12, or — times 12.
8 is — — of 20.	20 is — — of 8, or — times 8.
20 is — — of 25.	25 is — — of 20, or — times 20.
15 is — — of 25.	25 is — — of 15, or — times 15.
10 is — — of 25.	25 is — — of 10, or — times 10.
24 is — — of 30.	30 is — — of 24, or — times 24.
18 is — — of 30.	30 is — — of 18, or — times 18.
12 is — — of 30.	30 is — — of 12, or — times 12.

1. 25¢ pays for 15 lemons; 20¢ pays for — ———.
2. 20¢ pays for 8 oranges; 25¢ pays for ————.
3. 25¢ pays for 1 yard of ribbon; 20¢ pays for ————.
4. 24¢ pays for 1 doz. eggs; 30¢ pays for ————.

5. Alice has 50¢; Jane has 40¢; if Alice can buy 15 yards of ribbon, Jane can buy ——— yards.

6. Benjamin has 30¢; Samuel has 50¢; if Benjamin can buy 9 pencils, Samuel can buy ——— pencils.

7. If 20 quarts of oats are sufficient for 6 ponies, 50 quarts are sufficient for ——— ponies.

8. If 20 lb. of nails cost $1, 25 lb. will cost ——— dollars.

9. If a man can earn $8 in 16 hours, in 20 hours he can earn ——— dollars.

Ratio and Proportion.

1. Ten oranges are worth —— and —— —— times as much as 8 oranges. If 8 oranges are worth 20¢, 10 oranges are worth —— cents.

2. Twenty eggs are worth —— and —— —— times as much as 15 eggs. If 15 eggs are worth 18¢, 20 eggs are worth —— cents.

3. Eight horses consume —— —— as many oats in a week as 10 horses. If 10 horses consume 15 bushels, 8 horses consume —— bushels.

4. A man can earn —— —— as much money in 6 days as he can earn in 8 days. If he can earn $20 in 8 days, in 6 days he can earn ——.

5. If 12 lb. of sugar are worth 80¢, 15 lb. are worth ——.

6. 1½ times 8, means, once 8 and ½ of 8, or ——.

7. 1¼ times 9, means, once 9 and ¼ of 9, or ——.

8. 1¼ times 10, means, once 10 and ¼ of 10, or ——.

9. 1½ times 18 = 1½ times 19 =

10. 1⅓ times 18 = 1⅓ times 19 =

11. 1¼ times 12 = 1¼ times 13 =

12. 1½ times 5 = 1½ times 7 =

13. 1⅓ times 8 = 1⅓ times 11 =

14. 1¼ times 11 = 1¼ times 14 =

15. Ten bushels of bran are worth —— and —— —— times as much as 8 bushels. If 8 bushels are worth 9 dollars, 10 bushels are worth —— dollars.

16. Ten bags of salt are worth —— and —— —— times as much as 8 bags. If 8 bags are worth $5, 10 bags are worth ——.

17. If 8 bushels of oats will feed 20 horses, 6 bushels will feed ——.

Review Problems.*

ADDITION.

(a)	(b)	(c)	(d)	(e)
$734\frac{3}{8}$	$574\frac{1}{2}$	74.3	24.35	65.2
48	132	156	6.07	74.8
$351\frac{1}{8}$	$356\frac{1}{4}$	17	21.4	53.5
123	47	842.5	8.25	87.6
$246\frac{5}{16}$	$187\frac{1}{8}$	7.2	36.36	95.3
75	84	155	5.5	42.7

(f) Add twenty-four and seven tenths, and eight and forty-three hundredths..

SUBTRACTION.

(g)	(h)	(i)	(j)	(k)
$643\frac{3}{8}$	954	725	34.76	89.1
$171\frac{1}{4}$	$328\frac{5}{8}$	186.2	18.29	42.8

(l) From twenty-five and eight tenths, take twelve and five hundredths.

MULTIPLICATION.

(m)	(n)	(o)	(p)	(q)
$324\frac{5}{16}$	482	534	6.25	2.75
6	$7\frac{1}{4}$	$23\frac{1}{4}$	5	8

(r) Multiply nine and four hundredths by six.

DIVISION.

(s)	(t)	(u)	(v)
$2\frac{1}{8})154$*	\$.04)\$6.24†	4)\$6.24†	\$.05)\$9†

(w) Divide forty-three and two hundredths by three hundredths.

* See foot-note, page 184.
† Tell the meaning. Tell the suggested number story.

Common Fractions.

halves fourths fifths tenths twentieths

1. One half is —— twentieths.
2. One fourth is —— twentieths.
3. One fifth is —— twentieths.
4. One tenth is —— twentieths.
5. One fourth and 1 twentieth are ——.
6. One fourth less 1 twentieth are ——.
7. One fifth and 1 twentieth are ——.
8. One fifth less 1 twentieth are ——.
9. Nine twentieths and 1 fourth are ——.
10. Nine twentieths less 1 fourth are ——.
11. Eleven twentieths and 1 fifth are ——.
12. Eleven twentieths less 1 fifth are ——.

13. $\frac{7}{10} + \frac{3}{20} =$ $\frac{7}{20} - \frac{3}{20} =$
14. $\frac{9}{20} \times 2 =$ $20 \times \frac{7}{10} =$ *
15. $20 \times 2\frac{7}{10} =$ * $\frac{7}{10} \div \frac{3}{20} =$ *
16. $2 \div \frac{7}{10} =$ * $\frac{7}{10} \div 2 =$ *

For the Slate.

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$837\frac{1}{4}$	$756\frac{4}{5}$	$536\frac{1}{20}$	$2)\$847\frac{1}{2}$
$325\frac{1}{5}$	$132\frac{7}{20}$	3	

(a) Tell the meaning. (b) Copy and complete. (c) Tell the suggested number story.

(e) 6 ounces)444 ounces.

(f) 6)444 ounces.

(g) 5 miles)705 miles.

(h) 5)705 miles.

* What does the expression mean? See foot-notes, page 175.

Common Fractions.

1. Add $\frac{3}{10}$ and $\frac{7}{10}$. $\frac{3}{8} + \frac{1}{4} =$
2. Add $\frac{3}{4}$ and $\frac{1}{8}$. $\frac{1}{8} + \frac{1}{10} =$
3. From $\frac{7}{10}$ subtract $\frac{3}{10}$. $\frac{3}{8} - \frac{1}{4} =$
4. From $\frac{3}{4}$ subtract $\frac{1}{8}$. $\frac{3}{8} - \frac{1}{10} =$
5. Multiply 15 by $2\frac{1}{3}$. $15 \times 2\frac{1}{3} =$
6. Multiply $4\frac{3}{7}$ by 5. $4\frac{3}{7} \times 6 =$
7. Divide $\frac{3}{10}$ by 2. $\frac{3}{8} \div 2 =$
8. Divide $2\frac{1}{10}$ by $\frac{7}{10}$. $2\frac{1}{8} \div \frac{7}{10} =$ *
9. Find the sum of 8.1 and $7\frac{3}{10}$. $5.3 + 2\frac{3}{10} =$
10. Find the sum of $6\frac{1}{4}$ and $4\frac{1}{8}$. $7.1 + 5\frac{3}{8} =$
11. Find the difference of 11 and $2\frac{7}{10}$. $8 - 1\frac{1}{10} =$
12. Find the difference of $6\frac{1}{2}$ and $3\frac{1}{10}$. $7 - .9 =$
13. Find the product of 12 multiplied by $2\frac{3}{4}$.
14. Find the product of $2\frac{3}{4}$ multiplied by 12.
15. Find the quotient of $\frac{3}{8}$ divided by 4.
16. Find the quotient of 4 divided by $\frac{3}{8}$.
17. Find the quotient of $1\frac{3}{8}$ divided by 4.
18. Find the quotient of 4 divided by $1\frac{3}{8}$.
19. $\frac{1}{2} + \frac{1}{4} + \frac{1}{10} =$ $\frac{1}{2} + \frac{1}{8} + \frac{1}{10} =$
20. $\frac{1}{4} + \frac{1}{8} + \frac{1}{10} =$ $\frac{1}{2} + \frac{1}{10} + \frac{1}{10} =$
21. $\frac{1}{4} + \frac{1}{10} + \frac{1}{10} =$ $\frac{1}{8} + \frac{1}{10} + \frac{1}{10} =$
22. $\frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{10} + \frac{1}{10} =$

For the Slate.

(a) Add.	(b) Subtract.	(c) Multiply.	(d) Divide.
$724\frac{1}{8}$	$846\frac{3}{4}$	534	8)964
$136\frac{3}{4}$	$183\frac{3}{8}$	$7\frac{1}{7}$	

* $2\frac{1}{8} = \frac{11}{8}$; 7 tenths are contained in 22 tenths —— times.

For the Slate.

(a) At $240 an acre, how much will 3.2 acres of land cost?

(b) Find the cost of 9 sheep at $3.45 a head.

(c) A lady paid $6.80 for a hat and ½ as much for shoes. Find the cost of both.

(d) If 7 tons of coal cost $45.50, how much does one ton cost?

(e) A man bought two horses for $300; he sold one of them for $160, and the other for $180. How much did he gain?

(f) When cheese is worth $.08 a pound, how many pounds can be bought for $28.64?

(g) At $.05 a pound, how many pounds of sugar will cost $24.50?

(h) The lot upon which Mr. Smith's new house stands cost $1300; the house cost 6 times as much as the lot. Find the cost of both.

(i) Mr. Brown put into the bank on Monday, $24.30; on Tuesday, $11.50; on Wednesday, $13.45; on Thursday, $6.84; on Friday, $42; on Saturday, $13.75. How much in all?

(j) Mr. Jones had $75.40 in the bank; he put in $15.20 and soon after drew out $42.30. How much did he then have in the bank?

(k) John spent two thirds of his money and had $1.45 left. How much did he spend?

(l) Henry spent one third of his money and had $2.76 left. How much did he spend?

(m) Mr. Johnson owed Mrs. Williams $36.45 and $41.32; he gave her 4 20-dollar bills. How much change should he receive?

(n) Mr. Whitney rents a house for $15.50 a month. In one year the rent will amount to how much?

(o) At $2.75 a day, how much does a man earn in three weeks?

Simple Numbers.*

(a)	(b)	(c)
$553	$182.5	$15.44
5)$2765	3)$547.5	4)$61.76
25	3	4
26	24	21
25	24	20
15	7	1.7
15	6	1.6
	1.5	.16
	1.5	.16

(d) Divide $3265 by 5.
(e) Divide $184.8 by 4.
(f) Divide $35.46 by 6.
(g) $4722 ÷ 3 =
(h) $573.2 ÷ 2 =
(i) $43.54 ÷ 7 =

(j)	(k)	(l)
553 times.	1825 times.	1544 t's.
$5)$2765	$.3)$547.5	$.04)$61.76
25	3	4
26	24	21
25	24	20
15	7	1.7
15	6	1.6
	1.5	.16
	1.5	.16

(m) Divide $4735 by $5.
(n) Divide $56.25 by $.05.
(o) Divide $86 by $.05.
(p) $346.5 ÷ $.5 =
(q) $785 ÷ $.5 =
(r) $57 ÷ $.5 =

* If the pupil is required to *tell the meaning* of each problem on this page, and to *tell the number story* suggested by the figures and the relations of the numbers they represent, no "rule for pointing off" will be necessary. Problem (d) means, find 1 fifth of $3265. Paid $3265 for 5 acres of land; 1 acre cost —— dollars. Problem (n) means, find how many times $.05 (5 cents) is contained in $56.25. If tablets cost $.05 each, for $56.25 I can buy —— tablets.

Denominate Numbers.

1. The product of 2 qt. 1 pt. and 3 is ————.*
(a) Find the product of 27 qt. 1 pt. and 5.

2. The product of 5 gal. 3 qt. and 2 is ————.
(b) Find the product of 26 gal. 3 qt. and 5.

3. The product of 3 ft. 5 in. and 3 is ————.
(c) Find the product of 54 ft. 5 in. and 4.

4. The product of 2 bu. 1 pk. and 5 is ————.
(d) Find the product of 2 bu. 1 pk. and 24.

5. The product of 4 yd. 2 ft. and 2 is ————.
(e) Find the product of 36 yd. 2 ft. and 4.

6. The product of 3 pk. 5 qt. and 2 is ————.
(f) Find the product of 3 pk. 5 qt. and 16.

7. The product of $2.23 and 2 is ————.
(g) Find the product of $37.23 and 4.

8. The product of 3 lbs. 2 oz. and 3 is ————.
(h) Find the product of 37 lbs. 4 oz. and 6.

9. The product of 2 hr. 10 min. and 3 is ————.
(i) Find the product of 15 hr. 30 min. and 6.

10. The product of 2 sq. yd. 5 sq. ft. and 2 is ————.
(j) Find the product of 12 sq. yd. 5 sq. ft. and 6.

11. The product of 5 sq. ft. 20 sq. in. and 3 is————.
(k) Find the product of 25 sq. ft. 20 sq. in. and 6.

12. The product of 3 wk. 4d. and 2 is ——.
(l) Find the product of 19 wk. 5d. and 3.

13. Tell as many "number stories" as you can that are suggested by the problems on this page.

* After this has been solved "mentally," show how it would appear upon the blackboard as a problem in multiplication of denominate numbers.

$$\begin{array}{r} 2 \text{ qt. } 1 \text{ pt.} \\ \times \quad 3 \\ \hline 7 \text{ qt. } 1 \text{ pt.} \end{array}$$

Measurements.

1. A rectangle $1\frac{1}{2}$ inches wide and 10 inches long contains ——— square inches.

(a) A rectangular piece of land is $1\frac{1}{2}$ feet wide and 246 feet long. How many square feet does it contain?

2. A rectangle 1 yd. wide and 12 feet long contains ——— square feet, or — — square yards.

(b) A rectangular piece of land is 1 yard wide and 126 feet long. How many square feet does it contain? Square yards?

3. A rectangle contains 24 square inches; it is 3 inches wide; it is ——— inches long.

(c) A rectangular piece of land contains 932 square feet; it is 4 feet wide. How long is it?

4. The area of one face of a 12-inch cube is ——— square inches.

(d) What is the area of all the faces of a 12-inch cube?

5. Think of a box that is 12 inches long, 6 inches wide and 4 inches high.

(1) The area of the top of the box is ——— square inches.

(2) The area of the bottom of the box is ——— square inches.

(3) The area of one side of the box is ——— square inches.

(4) The area of one end of the box is ——— square inches.

(e) What is the area of the entire outside of a box that is 10 inches long, 6 inches wide and 4 inches high?

6. Think of a room that is 13 feet long, 10 feet wide and 9 feet high.

(1) The area of the ceiling is ——— square feet.

(2) The area of one end wall is ——— square feet.

(f) How many square yards in both end walls?

(g) How many square yards in both side walls?

Measurements.

1. One foot is ——— inches. 2 ft. = ——— inches.
2. One square foot is ——— square inches.
3. One yard is ——— feet. 2 yd. = ——— feet.
4. One square yard is ——— square feet.
5. Three square yards are ——— square feet.
6. Five square yards are ——— square feet.

7. 4 yd. = ——— ft. 5 yd. = ——— ft. 6 yd. = ——— ft.

(a) 124 yards are how many feet? *

8. 2 sq. yd. = ——— sq. feet. 5 sq. yd. = ——— sq. feet.

(b) 42 sq. yd. are how many sq. feet?

9. 2 ft. = ——— in. 5 ft. = ——— in. 7 ft. = ——— in.

(c) 54 feet are how many inches?

10. 1 sq. foot = ——— sq. in. 2 sq. ft. = ——— sq. in.

(d) 5 square feet are how many square inches?

11. 6 ft. = ——— yd. 9 ft. = ——— yd. 13 ft. = ——— yd.

(e) 132 feet are how many yards?

12. 18 sq. ft. = ——— sq. yd. 27 sq. ft. = ——— sq. yd.

(f) 234 square feet are how many square yards?

13. 36 inches = ——— feet. 25 inches = ——— feet.

(g) 432 inches are how many feet?

14. 144 sq. in. = ——— sq. ft. 288 sq. in. = ——— sq ft.

(h) 1728 square inches are how many square feet?

15. 1 yd. 1 ft. = ——— inches. 2 yd. 1 ft. = ——— inches.

(i) 8 yd. 2 ft. are how many inches?

* Lead the pupil to see that this problem may be solved by multiplying 3 feet by 124—by taking 3 feet 124 times, *i.e.*, 100 times + 20 times + 4 times; but that, as a matter of convenience, in practice we multiply 124 (not yards) by 3; that the real multiplicand—that which is to be repeated, is 3 feet. Later the pupil may be taught to think that there are three times as many feet as yards—if there are 124 yards there are 3 times 124 feet.

Ratio and Proportion.

1. 25 is ——— of 35. 35 is ——— ——— of 25.*
2. 21 is ——— ——— of 28. 28 is ——— ——— of 21.
3. 28 is ——— ——— of 35. 35 is ——— ——— of 28.
4. 24 is ——— ——— of 36. 36 is ——— ——— of 24.
5. 32 is ——— ——— of 40. 40 is ——— ——— of 32.

6. Two thirds of 24 are ———. 24 is $\frac{2}{3}$ of ———.
7. Three fourths of 24 are ———. 24 is $\frac{3}{4}$ of ———.
8. One half of 24 is ———. 24 is $\frac{1}{2}$ of ———.
9. Four sevenths of 28 are ———. 28 is $\frac{4}{7}$ of ———.
10. Two thirds of 30 are ———. 30 is $\frac{2}{3}$ of ———.

11. One half of 20 is one third of ———.
12. One fourth of 20 is one third of ———.
13. One fifth of 20 is one third of ———.
14. One half of 20 is two thirds of ———.

15. One half of 1 half is ——— ———.
One half of 1 fourth is ——— ———.
One half of 1 eighth is ——— ———.

16. One third of 1 half is ———.
One third of 1 sixth is ——— ———.
Two thirds of 1 half is ——— ———.

17.

One half is two thirds of ——— ———.
One half (a+b) is two thirds of a+b+c.

18.

One half is three fourths of ——— ———.
One half (a + b + c) is three fourths of a + b + c + d.

* Remind the pupil that the expression seven fifths of twenty-five means *seven times one fifth of twenty-five.*

Ratio and Proportion.

1. Fifteen oranges are worth ———— times as much as 6 oranges. If 6 oranges are worth 10¢, 15 oranges are worth —— cents.

2. Twenty-one bushels of potatoes are worth —— —— as much as 28 bushels. If 28 bushels are worth $12, 21 bushels are worth —— dollars.

3. Twenty horses consume ———— times as much hay in a month as 8 horses. If 8 horses consume 2 tons, 20 horses consume —— tons.

4. A man can earn ———— as much money in 15 days as he can earn in 20 days. If he can earn $48 in 20 days, in 15 days he can earn —— dollars.

5. If 8 lbs. of sugar are worth 40¢, 16 lb. are worth —— cents; 24 lb. are worth —— cents, 28 lb. are worth —— cents.

6. $2\frac{1}{2}$ times 8, means, 2 times 8 and $\frac{1}{2}$ of 8, or ——.

7. $2\frac{1}{2}$ times 9, means, 2 times 9 and $\frac{1}{2}$ of 9, or ——.

8. $2\frac{1}{2}$ times 11, means, 2 times 11 and $\frac{1}{2}$ of 11, or ——.

9. $2\frac{1}{2}$ times $\frac{1}{4}$, means, 2 times $\frac{1}{4}$ and $\frac{1}{2}$ of $\frac{1}{4}$, or ——.

10. $2\frac{1}{2}$ times $\frac{1}{6}$, means, 2 times $\frac{1}{6}$ and $\frac{1}{2}$ of $\frac{1}{6}$, or —— ——.

11. $2\frac{1}{2}$ times $\frac{1}{8}$, means, 2 times $\frac{1}{8}$ and $\frac{1}{2}$ of $\frac{1}{8}$, or ——.

12. $2\frac{1}{2}$ times 12 = $2\frac{1}{2}$ times 13 = $2\frac{1}{2}$ times 15 =

13. $2\frac{1}{2}$ times $1\frac{1}{2}$ = $2\frac{1}{2}$ times $2\frac{1}{2}$ = $2\frac{1}{2}$ times $4\frac{1}{2}$ =

14. $2\frac{1}{2}$ times $\frac{3}{8}$ = $2\frac{1}{2}$ times $\frac{2}{5}$ = $2\frac{1}{2}$ times $\frac{4}{11}$ =

15. Twenty oranges are worth ———— times as much as 8 oranges. If 8 oranges are worth $\frac{2}{5}$ of a dollar, 20 oranges are worth ————.

16. Ten bags of salt are worth ———— times as much as 4 bags. If 4 bags are worth $1\frac{1}{2}$, 10 bags are worth ——.

17. If 5 bushels of oats will feed 20 horses, 7 bushels will feed —— horses.

Review Problems.

ADDITION.

(a)	(b)	(c)	(d)	(e)
$536\frac{1}{8}$	$537\frac{1}{2}$	85.2	36.24	7.42
74	86	175.3	5.02	8.67
$185\frac{1}{4}$	275	64	7.32	2.84
126	$326\frac{3}{10}$	$326\frac{6}{10}$	78	3.96
$78\frac{3}{10}$	175	75	$39\frac{5}{10}$*	7.58
642	54	144	75	2.75

(f) Add seventy-four and eight hundredths, and seventy-four and eight tenths.

SUBTRACTION.

(g)	(h)	(i)	(j)	(k)
$975\frac{3}{10}$	874	864	36.75	37.4
$146\frac{1}{10}$	$287\frac{1}{16}$	235.3	21.46	18.7

(l) From four hundred and twenty-six, take twenty-five and thirty-six hundredths.

MULTIPLICATION.

(m)	(n)	(o)	(p)	(q)
$246\frac{3}{10}$	585	362	8.75	825
7	$5\frac{1}{7}$	34	6	4.3

(r) Multiply forty-six by thirty-four.

DIVISION.

(s)	(t)	(u)	(v)
$3\frac{1}{2})168$†	$.06)$8.34‡	$.6)$8.34‡	$.04)$11.

(w) Divide seventy-five and forty-five hundredths by five hundredths.

* $\frac{5}{10}$ = —— hundredths. † See foot-note, page 184.
‡ Tell the meaning. Tell the suggested number story.

Simple Numbers.*

(a)	(b)	(c)
$258	$21.5	$3.17
25)$6450	25)$537.5	25)$79.25
50	50	75
145	37	4.2
125	25	2.5
200	12.5	1.75
200	12.5	1.75

(d) Divide $3250 by 25.† (e) $8125 ÷ 25 =
(f) Divide $572.5 by 25. (g) $547.5 ÷ 25 =
(h) Divide $61.75 by 25. (i) $83.50 ÷ 25 =

(j)	(k)	(l)
258 times.	215 times.	317 t's.
$25)$6450	$2.5)$537.5	$.25)$79.25
50	50	75
145	37	4.2
125	25	2.5
200	12.5	1.75
200	12.5	1.75

(m) Divide $6125 by $25.‡ (n) $2875 ÷ $25 =
(o) Divide $337.5 by $2.5. (p) $712.5 ÷ $2.5 =
(q) Divide $84.50 by $.25. (r) $55.50 ÷ $.25 =

* Review page 238. Tell the meaning of each problem on this page. Tell a suggested number story for each one. Do this many times and no "rule for pointing off" will be necessary. In the solution of problems like (b) and (c), the pupil should be taught to place the decimal point in the quotient *immediately after writing the units' figure of the quotient.*

† This means, *find 1 twenty-fifth of $3250.* Paid $3250 for 25 acres of land; 1 acre cost ——.

‡ This means, *find how many times $25 are contained in $6125.* Paid $6125 for land at $25 an acre; there were —— acres.

Miscellaneous Problems.

1. Imagine a box 6 in. long, 4 in. wide and 2 in. high.
(1) The area of the top of the box is —— —— ——.
(2) The area of the bottom of the box is —— —— ——.
(3) The area of one side of the box is —— —— ——.
(4) The area of one end of the box is —— —— ——.
(5) Can you tell with your pencil the area of the entire outside of the box?

(a) Imagine a room 12 ft. long, 15 ft. wide and 8 ft. high.
(1) What is the area of the floor?
(2) What is the area of the ceiling?
(3) What is the area of one side wall?
(4) What is the area of both side walls?
(5) What is the area of one end wall?
(6) What is the area of both end walls?
(7) What is the entire area of floor, ceiling, and walls?

2. A rectangular surface 3 ft. wide and 12 ft. long contains —— square feet. It contains —— square yards.
(b) A rectangular surface 6 ft. wide and 30 ft. long contains how many square feet? How many square yards?

3. The area of a rectangular surface 3 ft. wide and 10 ft. long is —— square feet. It is —— square yards.
(c) The area of a rectangular surface 6 ft. by 35 ft. is how many square feet? How many square yards?

4. 3 ft. 2 in. = —— inches. 2 ft. 5 in. = —— inches.
(d) 24 ft. 6 inches are how many inches?

5. 5 yd. 2 feet = —— feet. 7 yd. 1 foot = —— feet.
(e) 46 yards 2 feet are how many feet?

6. At 9¢ a dozen for $.54 I can buy —— dozen eggs.
(f) At $.09 a dozen, how many dozen eggs can I buy for $21.60?

Miscellaneous Problems.

7. If a man's wages are $40 for 5 weeks, in one week he earns —— dollars.

(g) If a man's wages are $216 for 9 weeks, how much does he earn in one week?

8. If 6 barrels of flour are worth $48, 2 barrels are worth —— dollars.

(h) If 6 acres of land are worth $264, how much are 2 acres worth?

9. At the rate of 3 oranges for 10¢, for 60¢ I can buy —— oranges.

(i) At the rate of 3 oranges for 10¢, how many oranges can I buy for $2.60?

10. If 5 sheep cost $21, at the same rate 10 sheep will cost —— dollars.

(j) If 5 tons of bran cost $62.50, at the same rate how much will 10 tons cost? *

11. If 7 books cost $2, at the same rate 28 books will cost —— dollars.†

(k) If 7 acres of land cost $25.30, how much will 28 acres cost at the same rate?

12. If 5 bushels of apples cost $2.20, at the same rate 15 bushels will cost ————.

(l) If 5 tons of flour cost $140.25, how much will 15 tons cost at the same rate?

13. At $.04 each, for $.32 I can buy —— pencils.

(m) At $.04 each, how many pencils can be bought for $21.20?

* If necessary, lead the pupil to see that 10 tons cost twice as much as 5 tons.

† 28 books cost 4 times as much as 7 books.

Miscellaneous Problems.

14. Forty-eight quarts are —— gallons.
(n) How many gallons are 572 quarts?

15. Fifty pints are —— gallons.
(o) How many gallons are 290 pints?

16. A grocer sold 2 barrels of apples at $2.30 each; he received for them ————.
(p) A farmer sold 24 barrels of apples at $2.15 each. How much did he receive for them? *

17. One surface is a 4-inch square; another is 2 in. by 3 in.; the difference of these surfaces is —— square inches.
(q) One surface is a 20-foot square; another is 5 feet by 35 feet. What is the difference of these surfaces?

18. A pencil cost 5¢; a book cost 6 times as much; both together cost ————.
(r) A harness cost $17.25; a carriage cost 5 times as much. Find the cost of both.

19. A surface is 8 inches long and $5\frac{1}{2}$ inches wide; it contains —— square inches.
(s) A surface is 46 feet long and $6\frac{1}{2}$ feet wide. How many square feet is it?

20. A dealer sold 6 bushels of oats for $1.80; the price per bushel was ————.
(t) A farmer sold 25 bushels of wheat for $18.75. What was the price per bushel?

* In the solution of this problem, require the pupil to place the decimal point in the first partial product as soon as he has multiplied 15¢ by 4. This will enable him to determine with certainty the place of the decimal point in the answer. He should also be led to see that the first partial product is the cost of 4 barrels; the second partial product, the cost of 20 barrels; and the sum of these the cost of 24 barrels.

Miscellaneous Problems.

21. Thomas sells oranges for 20¢ a dozen; this is 6¢ a dozen more than he paid for them; he paid —— a dozen.

(u) A man sold a farm for $9675; this was $1465 more than he paid for it. How much did he pay for the farm?

22. Bertha sold a chicken and a duck; for the chicken she received 25¢; for the duck she received 10¢ more than she did for the chicken; for both she received ————.

(v) A man sold a cow and a horse; for the cow he received $37.50; for the horse he received $24.50 more than he received for the cow. How much did he receive for both?

23. Helen spent 8¢ for paper, 4¢ for a pencil, and had 13¢ remaining. Before she bought the paper and pencil she had ————.

(w) Mr. Lewis spent $124.50 for clothing, $275.40 for groceries, and had $134.10 remaining. How much had he before he purchased the clothing and groceries?

24. Sarah cut a piece of ribbon that was 1 ft. 3 in. long into 3 equal pieces; each piece was —— inches long.

(x) A merchant cut a piece of carpet that was 46 feet, 6 in. long into 3 equal pieces. How long was each piece?

25. At $1.40 a pair, 2 pairs of shoes will cost ————.

(y) At $2.75 a pair, how much will 9 pairs of shoes cost?

26. The sum of 9 and 6 and 20 and 20 is ————.

(z) Find the sum of six thousand two hundred forty-two, one thousand eighty four, and seven hundred ninety-four.

27. Arthur's book cost 25¢; his slate cost 10¢ less than his book cost; his slate and book together cost ————.

(a) A man paid $5650 for a house; for a piece of land he paid $1000 less than he paid for the house. How much did the land and house together cost?

Review Problems.

ADDITION.

(a)	(b)	(c)	(d)
$308\frac{1}{7}$	$506\frac{1}{3}$	75.4	25 bu. 2 pk.
$64\frac{3}{4}$	$87\frac{1}{7}$	31.8	34 bu. 2 pk.

SUBTRACTION.

(a)	(b)	(c)	(d)
$187\frac{1}{8}$	$274\frac{1}{3}$	35.6	54 bu.
$38\frac{1}{14}$	$146\frac{1}{7}$	20.8	31 bu. 3 pk.

MULTIPLICATION.

(a) Multiply 54 by 32.
(b) $54 \times 3.2 =$
(c) Multiply 53 by 35.
(d) $53.5 \times 35 =$
(e) Multiply $53\frac{1}{2}$ by 35.
(f) $54.3 \times 35 =$
(g) Multiply $45\frac{1}{2}$ by 24.
(h) $45.5 \times 24 =$
(i) Multiply 48 by $25\frac{1}{2}$.
(j) $48 \times 25.5 =$
(k) Multiply 56 by $23\frac{1}{4}$.
(l) $56 \times 23.2 =$
(m) Multiply 64 by $18\frac{3}{4}$.
(n) $64 \times 18.7 =$
(o) Multiply 86 by $21\frac{1}{2}$.
(p) $86 \times 21.5 =$

DIVISION.

(a) Divide 2106 by 26.
(b) $220.8 \div 24 =$
(c) Divide 1272 by 24.
(d) $687.5 \div 25 =$
(e) Divide 4150 by 25.
(f) $57.46 \div 26 =$
(g) Divide 8372 by 26.
(h) $31.75 \div 25 =$
(i) Divide 5842 by 23.
(j) $637.2 \div 27 =$
(k) Divide 8235 by 27.
(l) $820.8 \div 27 =$
(m) Divide 6345 by 27.
(n) $63.18 \div 27 =$
(o) Divide 8475 by 25.
(p) $94.25 \div 25 =$

Definitions and Explanations.*

A **unit** is one.

A **number** is one or it is composed of ones.

Notation is the art of expressing numbers by figures or other characters.

ARABIC NOTATION.

In the Arabic Notation **figures** are employed. The figures are: 1, 2, 3, 4, 5, 6, 7, 8, 9, 0.

In the number 29, the figure 9 is said to stand in the *first place* and the figure 2, in the second place.

In the number 437, the figure 7 is said to stand in the first place, the figure 3 in the second place, and the figure 4 in the third place.

In the number 8156, the figure 6 is said to stand in the first place, the figure 5 in the second place, the figure 1 in the third place, and the figure 8 in the fourth place.

A figure in the first place expresses *units*.

A figure in the second place expresses *tens*.

A figure in the third place expresses *hundreds*.

A figure in the fourth place expresses *thousands*.

A figure in the fifth place expresses *tens of thousands*.

In the number 4.65, the figure 6 is said to be in the *first decimal place;* the figure 5, in the second decimal place.

A figure in the first decimal place expresses *tenths*.

A figure in the second decimal place expresses *hundredths*.

Tell what each figure expresses in the following combination: 2764.35.

ROMAN NOTATION.

In the Roman Notation **seven capital letters** are employed. The letters are—I, V, X, L, C, D, M.

I. = 1, V. = 5, X. = 10, L. = 50, C. = 100, D. = 500, M. = 1000.

PRINCIPLES.

When a letter is repeated its value is repeated. XX. = 20. II. = 2.

When a letter is placed before one of greater value, the difference of their values must be taken. IX. = (10 − 1) = 9.

When a letter is placed between two letters each of greater value, its value is taken from the last letter. XIX. = 10 + 10 − 1 = 19.

Placing a short horizontal line over a letter multiplies its value by 1000. $\overline{X}$. = 10,000.

Sometimes small letters are employed instead of capitals; thus, ii = 2, iv = 4, etc.

* See that the pupil can read the following pages intelligently before he is asked to commit to memory any part of them.

Roman Notation Table.

I. = 1.*	XXX. = 30.	XXXVIII. = ——— .
II. = 2.	XL. = 40.	XLVI. = — .
III. = 3.	L. = 50.	MDCC. = ———.
IV. = 4.	LX. = 60.	XCIX. = — —.
V. = 5.	LXX. = 70.	CCCVI. = — —.
VI. = 6.	LXXX. = 80.	DXLV. = — —.
VII. = 7.	XC. = 90.	XXIV. = - —.
VIII. = 8.	C. = 100.	XXXXIV. = ———.
IX. = 9.	CC. = 200.	LXXVI. = ———.
X. = 10.	CCC. = 300.	XLVII. = ———.
XI. = 11.	CCCC. = 400.	XXXII. = ———.
XII. = 12.	D. = 500.	XCVII. = ———.
XIII. = 13.	DC. = 600.	LVIII. = ———.
XIV. = 14.	DCC. = 700.	CCXIX. = ———.
XV. = 15.	DCCC. = 800.	DXIX. = ———.
XVI. = 16.	DCCCC. = 900.	MXIX. = ——.
XVII. = 17.	M. = 1000.	LXXXI. = ———.
XVIII. = 18.	MM. = 2000.	LXIV. = ———.
XIX. = 19.	$\overline{V}$. = 5000.	MDCCC. = ———.
XX. = 20.		MDCCCXCVI. = ———.

The author of this book was born Feb. IX., in the year of our Lord MDCCCXLI.

The Roman notation is now chiefly employed in numbering chapters or lessons, in dates, and upon the dials of time-pieces.

How is the number four represented upon the face of a clock?

ADDITION.

Addition is the process of uniting two or more numbers into one number.

The **sum** is the number obtained by adding.

$$\begin{array}{r} 26 \\ 49 \\ \hline 75 \end{array}$$ (Sum.)

* A period is usually placed after each completed Roman numeral.

SUBTRACTION.

Subtraction is the process of taking one number from (out of) another number.

The **minuend** is the number from which another number is taken.

The **subtrahend** is the number taken from another number.

The **difference** is the number obtained by subtracting.

$75	(Minuend.)
$38	(Subtrahend.)
$37	(Difference.)

Observe that the sum of the subtrahend and difference equals the minuend.*

MULTIPLICATION.

Multiplication is the process of taking one number as many times as there are units in another number.

The **multiplicand** is the number taken, or repeated.

The **multiplier** is the number that shows how many times the multiplicand is to be taken, or repeated.

$36	(Multiplicand.)
25	(Multiplier.)
$180	
$720	
$900	(Product.)

The **product** is the number obtained by multiplying.

In the example given, $180 and $720 are called the partial (part) products. $180 is the product of $36 and 5; $720 is the product of $36 and 20.

Observe that dividing the product by the multiplier gives the multiplicand.†

* Teach pupils to "prove" their problems in subtraction.

† Teach pupils to "prove" their problems in multiplication.

DIVISION.

Division is one of *two* processes.

I. It is finding how many times one number is contained in another number; $18 ÷ $2 = 9.

II. It is finding one of the equal parts of a number; $18 ÷ 2 = $9.

To divide $18 by $2 means to separate $18 into groups of $2 each and *count the groups.* To divide $18 by 2 means to separate $18 into 2 equal groups, and *count the dollars in one group;* that is, find one half of $18. In Case I. the quotient tells *how many times* the divisor is contained in the dividend. In Case II. the quotient is a *part of the dividend.*

To THE TEACHER.—The second case is often very properly called partition. But both processes are evidently cases of division, since in both instances we separate (divide) the given number into equal parts. In Case I. we count the parts (groups). In Case II. we count the units in each part (group).

The **dividend** is the number divided or separated.
The **divisor** is the number by which we divide.
The **quotient** is the number obtained by dividing.

Observe that in either case the product of the divisor and quotient equals the dividend.*

To THE TEACHER.—There can be no remainder in a complete division. Therefore, the product of the quotient and divisor is *always* equal to the dividend. We may have a remainder when the process of dividing is incomplete. In such a case the quotient is incomplete and the remainder is the undivided part of the dividend. To the product of the *incomplete quotient* and divisor add the remainder, and the sum thus obtained will be equal to the dividend.

An even number is the number two, or a number that can be separated into twos; as, 4, 6, 20, 40, 44, etc.

A number that cannot be exactly separated into twos is called an odd number; as, 3, 5, 7, 21, 71, etc.

* Teach the pupils to "prove" their problems in division.

Fractions.

A **fraction** is one or more of the equal parts of a unit.

A fraction is usually expressed by two numbers, one of them being written above a short horizontal line and the other below it; thus, $\frac{3}{4}$, $\frac{2}{5}$, $\frac{3}{16}$.

The number above the line is called the **numerator.**

The number below the line is called the **denominator.**

The denominator shows the number of equal parts into which the unit is divided.

The numerator shows the number of parts taken.

The denominators of some fractions are not usually expressed by figures; thus, 5 tenths is usually written, .5; 27 hundredths is usually written, .27.

Of the fraction $\frac{7}{8}$, 7 is the numerator and 8 is the denominator.

Of the fraction .5, 5 is the numerator and 10 is the denominator.

Of the fraction .27, 27 is the numerator and 100 is the denominator.

If the numerator and the denominator of a fraction are the same number, as $\frac{8}{8}$, $\frac{12}{12}$, $\frac{80}{80}$, etc., the fraction is equal to one unit.

If the numerator of a fraction is greater than the denominator as $\frac{8}{8}$, $\frac{11}{10}$, $\frac{25}{6}$, etc., the fraction is equal to more than one unit.

A fraction whose numerator is equal to or greater than its denominator is called an **improper fraction.**

A fraction whose numerator is less than its denominator is called a **proper fraction.**

Two thirds, $\frac{3}{4}$, $\frac{5}{6}$, $\frac{80}{81}$, are proper fractions.

Five fourths, $\frac{7}{5}$, $\frac{8}{6}$, $\frac{85}{80}$, are improper fractions.

DRY MEASURE.

2 pints (pt.) = 1 quart (qt.).
8 quarts = 1 peck (pk.).
4 pecks = 1 bushel (bu.).

LIQUID MEASURE.

2 pints (pt.) = 1 quart (qt.).
4 quarts = 1 gallon (gal.).

MEASURE OF TIME.

60 seconds (sec.) = 1 minute (min.).
60 minutes = 1 hour (h.).
24 hours = 1 day (da.).
7 days = 1 week (wk.).
28 to 31 days = 1 month (mo.)
12 months = 1 year (yr.).
365 days = 1 common year.
366 days = 1 leap year.
52 weeks and 1 day = 1 common year.
52 weeks and 2 days = 1 leap year.

LINEAR MEASURE.

12 inches (in.) = 1 foot (ft.).
3 feet = 1 yard (yd.).

AVOIRDUPOIS WEIGHT.

16 ounces (oz.) = 1 pound (lb.).
2,000 pounds = 1 ton (T.).

SQUARE MEASURE.

144 square inches (sq. in.) = 1 square foot (sq. ft.).
9 square feet (sq. ft.) = 1 square yard (sq. yd.).

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